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# Fun-Cleaning System

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**To teach children to establish the habit of sharing housework**

Tsaiwei Lin

May 2012

Rochester Institute of Technology  
Rochester, NY  
A Thesis Submitted to the Faculty of  
The College of Imaging Arts and Sciences  
In Candidacy for the Degree of  
Master of Fine Arts in Industrial Design



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May 2012

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# Contents

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|   |           |
|---|-----------|
| <b>1. Abstract</b>                        |           |
| <b>2. Introduction -----</b>              | <b>1</b>  |
| <b>3. Preliminary Research -----</b>      | <b>3</b>  |
| • Family                                  |           |
| • Housework and Research                  |           |
| • Children                                |           |
| <b>4. Questionnaire -----</b>             | <b>10</b> |
| <b>5. Situation Analyze-----</b>          | <b>14</b> |
| A. Target Group                           |           |
| B. Housework                              |           |
| C. Environment                            |           |
| D. Summary                                |           |
| <b>6. Ideation Process -----</b>          | <b>22</b> |
| A. System Concept                         |           |
| B. Possible Directions                    |           |
| C. Preliminary Concept                    |           |
| <b>7. Design Process -----</b>            | <b>28</b> |
| <b>8. Prototype -----</b>                 | <b>35</b> |
| <b>9. Experience with Prototype -----</b> | <b>42</b> |
| <b>10. Final Development -----</b>        | <b>45</b> |
| • Hooks                                   |           |
| • Toy clean up set                        |           |

# Contents

---

- Trash can

|                |    |
|----------------|----|
| 11. Conclusion | 60 |
|----------------|----|

|               |    |
|---------------|----|
| 12. Reference | 62 |
|---------------|----|

- Books
- Website

|                             |    |
|-----------------------------|----|
| 13. Appendix: Questionnaire | 64 |
|-----------------------------|----|

|             |    |
|-------------|----|
| 14. Contact | 66 |
|-------------|----|

## Abstract

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This project originated with a single question: Why do many young adults today lack basic life skills? This question came to mind when I noticed that most of my college friends are clueless about how to do the laundry or how to use a vacuum cleaner. After giving this question considerable thought, I began to research changes in family relationships, culture, and psychology to better understand this phenomenon.

I have focused my research on Taiwan, my country. Most families in Taiwan distribute housework between the parents rather than among the children. The primary duty of children is to study hard and earn good grades to bring honor to their family. In this situation, children are unlikely to do housework because of their schoolwork load and leave the responsibility to their parents, which leads to poor behavior on the part of the children, who have no idea how to perform housework.

Additionally, when parents are responsible for all the housework, it results in greater stress and less quality family time. Children who grow up in this scenario often lack experience in doing housework and in receiving guidance from their parents. Without these basic life skills, it is more difficult for people to live independently, which is why more and more young adults are living with their parents even after they have begun working.

Therefore, I plan to design a system and devices to help parents as well as children in this situation. Parents will be able to teach basic housework skills to their children in a playful way so that children will be encouraged to start helping around the house.

### **KEY WORDS:**

Toys, Design, Housework, Children, Parents, Responsibility, Playful, Cleaning, Hooks, Hanging, Trash can, Clothes

This project originated with a single question: Why do most young adults today lack basic life skills? I noticed this problem when I was sharing dorm space with friends when I was working as a teacher in Taiwan.

Before studying at RIT, I spent four years as an art teacher in Taiwan. My students ranged in age from 7 to 22, allowing me to meet children and teenagers who were in different stages of their lives. During this period, I saw a lot of children who were clueless about “cleaning,” such as how to wash dishes, for example, how to wipe off a table or how to correctly use a broom. This made me wonder why people in Taiwan have little sense when it comes to housework. These are basic life skills that allow a person to become independent and start taking care of him or herself.

I later became interested in this problem and started this project to determine why people in our society are clueless about this important life skill. In the paper, I will document my design process, which includes the following categories of research:

1. Family: Research and study the percentage of housework shared in the family and its influence on Asian culture.
2. Housework and responsibility: Study the relationship between housework and shared responsibility. Analyze what type of housework is most suitable for children to start with.
3. Child development: Study children’s development in terms of psychology and physical abilities at different ages. The research will conclude what age is best to involve children in housework.

Ultimately, I plan to design products that will encourage children to start helping with housework, freeing parents from the responsibility and enabling them to spend quality time with their family. We might call this a “fun-cleaning” device, because I believe that with the aid of this device, housework will become more interesting and parents will be able to get their kids involved in housework more easily. Ideally, the final products designed would be for all types of families, but it is primarily meant for a single family now, and its design will specifically suit the Taiwanese family. After some preliminary studies, analysis, and research, I realize space is a major factor in this project and will benefit greatly by the final design.

Tight household space is a major issue for many Taiwanese families. Efficiently managing space for the children will result in more space for family activities and will offer a better quality of living.

People usually grumble about doing housework, but it is not until they urgently need to learn how to do it that they begin to research methods for doing it. Few people truly understand how big an issue housework really is until that day comes.

### • Family

This research is based on case studies from *Zeng-yung Lee (1998)*<sup>1</sup>, *Brannen, J. (1995)*<sup>2</sup>, and several researches from the “Survey of social development trends of Republic of China.”<sup>3</sup> In the “Family lifestyle statistics,”<sup>3</sup> I noticed that there is more research focusing on parents sharing housework than on children sharing housework.

|       | Hours per day |      |      |
|-------|---------------|------|------|
| Year  | 1994          | 2000 | 2003 |
| Men   | 1.39          | 1.42 | 1.49 |
| Women | 4.21          | 3.29 | 3.22 |

Figure 1. The hours Man and Woman do housework per day<sup>3</sup>

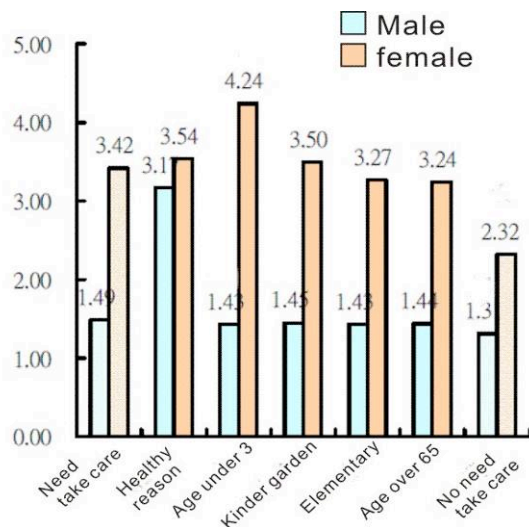


Figure 2. The hours Man and Woman sharing on each household<sup>3</sup>

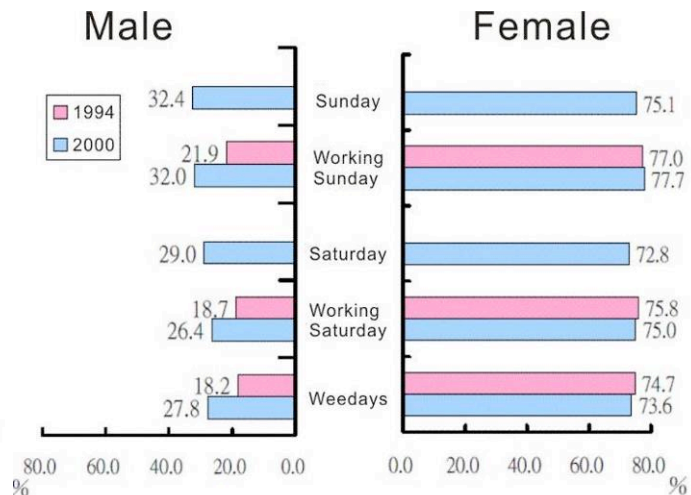


Figure 3. The percentage of Man and Woman sharing housework in a week.<sup>3</sup>

1. Zeng-yung Lee (1998) Parents assign household work to children
2. Brannen, J. (1995). *Young people and their contribution to household work*
3. Survey of social development trends of Republic of china(社會發展趨勢調查): <http://win.dgbas.gov.tw/dgbas03/ca/society/index.html>

One reason why children have been ignored in previous research is because of Asian culture. In traditional Asian culture, people commonly say, “Men take care of the bread and butter; women take care of the housework,” which shows that people have different expectations for each family member. Children are usually told to focus on school and avoid distractions such as video games. Housework is often considered one of the “distractions.” In Taiwan, over 70% of students go to cram school after day class. In “Common health research<sup>4</sup>” is shown that 62% of parents believe their children need to go to cram school so the kids “don’t lose the race at the starting point.” This phenomenon can be observed in Figures 4 and 5, as they illustrate how many afterschool classes a child typically takes.

Parents with high expectations for their children will generally have their children forgo housework and errands so that they can focus on school and studying.

|               |       |
|---------------|-------|
| One class     | 37.5% |
| Two classes   | 20.8% |
| Three classes | 21.7% |
| Four classes  | 20 %  |

Figure 4. Cram school classes taken percentage<sup>5</sup>

|         |       |
|---------|-------|
| English | 72.6% |
| Math    | 41.1% |
| Other   | 28.9% |

Figure 5. In Cram school major taken percentage<sup>5</sup>

Parents with this belief are usually under more stress as their children grow up and demand more quality time; yet parents are now occupied by errands and housework.

*In the public eye, children in the family are the factor that increases housework, not reduces it.” - Zeng-yung Lee, (1998)*

4. Common Heath magazine (<http://www.commonhealth.com.tw/article/article.action?id=5029267>)

5. 台灣兒童課後照顧概況調查報告記者會 (<https://www.children.org.tw/news.php?id=2225>)



For children's long-term development, it is important to balance responsibilities so children can focus on school and also be engaged with the family.

Balancing responsibilities also means parents have fewer chores and errands and more opportunities to spend time with their kids.

Financially, both husband and wife need to work to cover family expenses. This interferes with communication between parents and children, which leads to difficult parent-child relationships. Children who grow up in this type of family environment often lack life skills, show little desire to become independent, and end up relying on their parents even in adulthood.

Housework is essential for the family and provides a lot of opportunities for family members to engage with each other. Its dynamics also affect the family's happiness and the children's growth. I will define the meaning behind housework in the next section.

### **Housework and Responsibility**

Housework is more than just a load of dirty laundry. Considerable research evidence suggests that household work is an important context for children to learn about responsibility. Certain Western parents consider the development of responsibility as one of the primary reasons they assign regular jobs to their children (White & Brinkerhoff, 1981<sup>6</sup>; Goodnow & Delaney, 1989<sup>7</sup>).

*Work around the house provides an early context for the development of responsibility in children. Requiring children to perform work around the house is a widespread practice. - Rogoff et al., (1975)<sup>8</sup>*

---

6. White, L. K. & Brilnerhoff, D. B.(1981): Children's work in the family.

7. Goodnow, & S. Delaney (1989) Children's household work.

8. Rogoff, B (1975). Age of assignment of roles and responsibilities to children.

Asian parents concentrate more on protecting their children from the world and often do not provide opportunities for their children to gain experience, to be responsible, and to take care of themselves. This parenting style is very short-sighted.

Therefore, I contend that how both parents and children respond to housework offers a means of exploring children's sense of responsibility. In my study, two types of responsibility are addressed to solve the problem:

1. ***Causal responsibility*** - the concept that the person who caused the problem should be the one to solve it (*self-care*).
2. ***Continuing responsibility*** - the extent to which a sense of responsibility is still felt after a job has been delegated (*other-care*).

I will focus on causal responsibility, which refers to taking care of "your own" (i.e., your own mess, your own job, etc.), which involves self-care, such as making your own bed or putting away your own clothes. In one study (Goodnow & Delaney, 1989), parents are far more willing to ask a young child to take over a self-care task than an other-care task.

Children also view giving away a self-care job as less appropriate than giving away an other-care job. Children who did not make their bed, for example, reported that they would make it themselves rather than ask another child to do it. This is a good beginning for children to understand what responsibility means. In the future, it will be easier for children to understand that relationships and the associated social rules are also part of responsibility.

Another way to think about responsibility is in terms of self-regulation. Essentially, when people talk about children being self-responsible, it means that children will do those tasks without being reminded.

.

### Children

According to Piaget theory, “Stage Theory of Cognitive Development,” this table shows the different stages during which children process new information and transfer it into logic.

| Stages                      | Age      | How children process new information   |
|-----------------------------|----------|--|
| <b>Sensorimotor stage</b>   | 0 to 2   | Infants build an understanding of themselves and reality through interactions with the environment. They can differentiate between themselves and other objects. Learning takes place via assimilation and accommodation.                                      |
| <b>Preoperational stage</b> | 2 to 4   | The child is not yet able to conceptualize abstractly and needs concrete physical situations. Objects are classified in simple ways, especially according to important features.   |
| <b>Concrete operations</b>  | 7 to 11  | As physical experience accumulates, accommodation is increased. Children begin to think abstractly and to conceptualize, creating logical structures that explain their physical experiences.  |
| <b>Formal operations</b>    | 11 to 15 | Cognition reaches its final form. By this stage, the person no longer requires concrete objects to make rational judgments. They are capable of deductive and hypothetical reasoning. Their ability for abstract thinking is very similar to that of an adult. |

*Figure 6. Stage Theory of Cognitive Development, Piaget (1896-1980)<sup>9</sup>*

In my thesis, I want to focus on the stage at which children are capable of understanding the meaning of self-responsibility and are able to physically do the work.

Furthermore, on the physical side, children need to possess enough skills to do housework. Children who can master basic moves, such as throwing, catching, jumping, and running can handle housework in a safe measure.

9. Piaget theory: [http://en.wikipedia.org/wiki/Piaget%27s\\_theory\\_of\\_cognitive\\_development](http://en.wikipedia.org/wiki/Piaget%27s_theory_of_cognitive_development)

Based on Fig. 7, in the “Fundamental movement stage,” children start to pick up movement, which is an exciting time for the parents as well as the child. During this stage, children are actively involved in discovering and combining numerous movements, and with the help of their parents, children can increase their motor control and movement competence in a wide variety of activities.

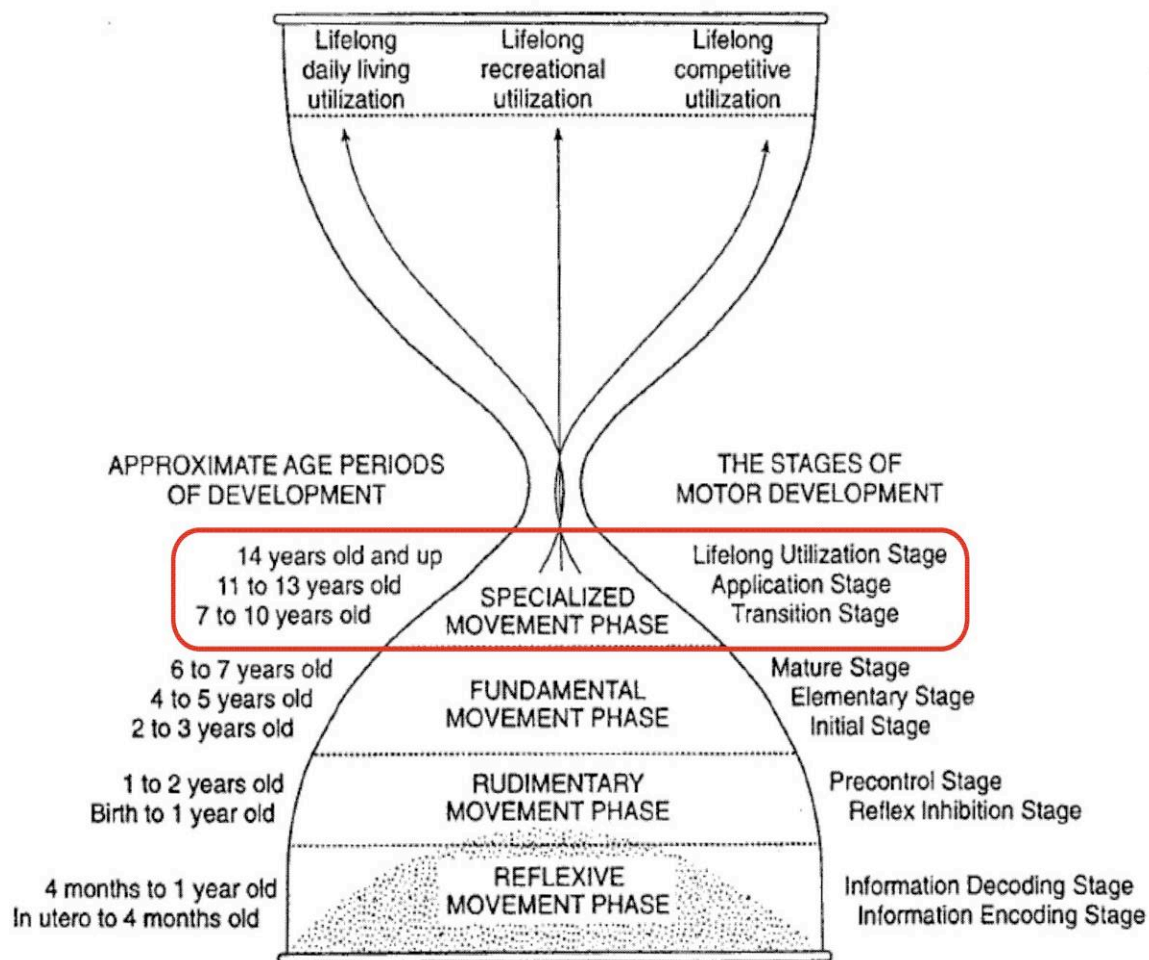


Figure 7. The phases of Children Motor Development<sup>10</sup>

However, in the “Fundamental movement phase,” children are just starting to combine numerous movements and beginning to learn, so they still need time to develop and perfect the movements. The continuing “Specialized movement phase” is a period

10. Gallahue, D.L. (1976). Motor development and movement experiences for young children.

in which fundamental stability, locomotors, and manipulative skills are progressively refined, combined, and elaborated upon for use in increasingly demanding situations.

Children are more able to handle housework on their own in this phase.

After analyzing, the “Concrete operations stage” and the “Specialized movement phase,” both meet with the findings of other studies. Children from ages 7 to 11 can better understand mental operations and are also capable of handling complicated physical movements. Therefore, my works will be based on children who fall in this age range.

After narrowing down my target group, I started researching more deeply into their lifestyles, habits, and activities. To better understand the target group, I designed a questionnaire to interview ten children. The “Appendix: Questionnaire” is attached at the end of this thesis and includes three areas: the family lifestyle, which relates to how family members share space in the house; the children’s cleaning habits and how much time children are willing to spend on cleaning; and questions focusing on children and what motivates them to learn.

The information gathered will guide me through the design process to ensure the final outcome truly meets the needs of the target group. Seven female children, three male children, and four adults were interviewed. Some of the interviewees allowed me to document their daily behavior in order to gain a general idea of the target group’s lifestyle.

**Summary**

1. Based on family space in Taiwan, 80% of the children must share a bedroom.
2. Over 60% of the children do not like to clean their rooms and rely on their parents or others do it for them.
3. Depending on the weather, over 90% of families do laundry every two to three days.
4. Children favorite housework: emptying the trash
5. Play time ranges from 30 minutes to 2 hours.
6. Most of the parents and children prefer to have a clean house. Parents especially want rooms to be clean so that children will concentrate more on studying.
7. All of the children need to attend cram school after day school, but over half of the children still perform some easy housework chores to help their parents.

The top housework task parents ask their children to do is pick up their toys without being reminded.



**Name:** Alex  
**Age:** 9  
**Gender:** male  
**Grade:** 3<sup>rd</sup>  
**Star Sign:** Leo  
**High:** 4'3 (130cm)  
**Interest:** Play T-Ball, watch cartoons, play computer games, ride bicycle, engage in outdoor activities with friends.



Figure 8. Children interviewed for the system.



**Name:** Brian  
**Age:** 10  
**Gender:** male  
**Grade:** 4<sup>th</sup>  
**Star Sign:** Gemini  
**High:** 4'7 (135cm)  
**Interest:** Play dodge ball, watch cartoons, play computer games, ride bicycle, engage in outdoor activities with friends.



Figure 9. Children interviewed for the system.





Figure 10. Children interviewed for the system.



Figure 11. Children interviewed for the system.



| Time        | Monday      | Tuesday        | Wednesday                 | Thursday         | Friday         |
|-------------|-------------|----------------|---------------------------|------------------|----------------|
| 16:30-18:00 | cram school | homework       | cram school (13:30-17:00) | cram school      | homework       |
| 18:00-18:30 | homework    | practice piano | play (17:00-19:20)        | homework         | practice piano |
| 18:30-19:00 | shower      | shower         | piano lesson              | dinner           | dinner         |
| 19:00-19:45 | dinner      | dinner         | watch TV                  | play on computer | shower         |
| 19:45-21:00 | watch TV    | watch TV       | shower                    | watch TV         | watch TV       |
| 21:00 after | sleep       | sleep          | sleep                     | sleep            | sleep          |

Figure 12.A 4<sup>th</sup> grade elementary student daily schedule

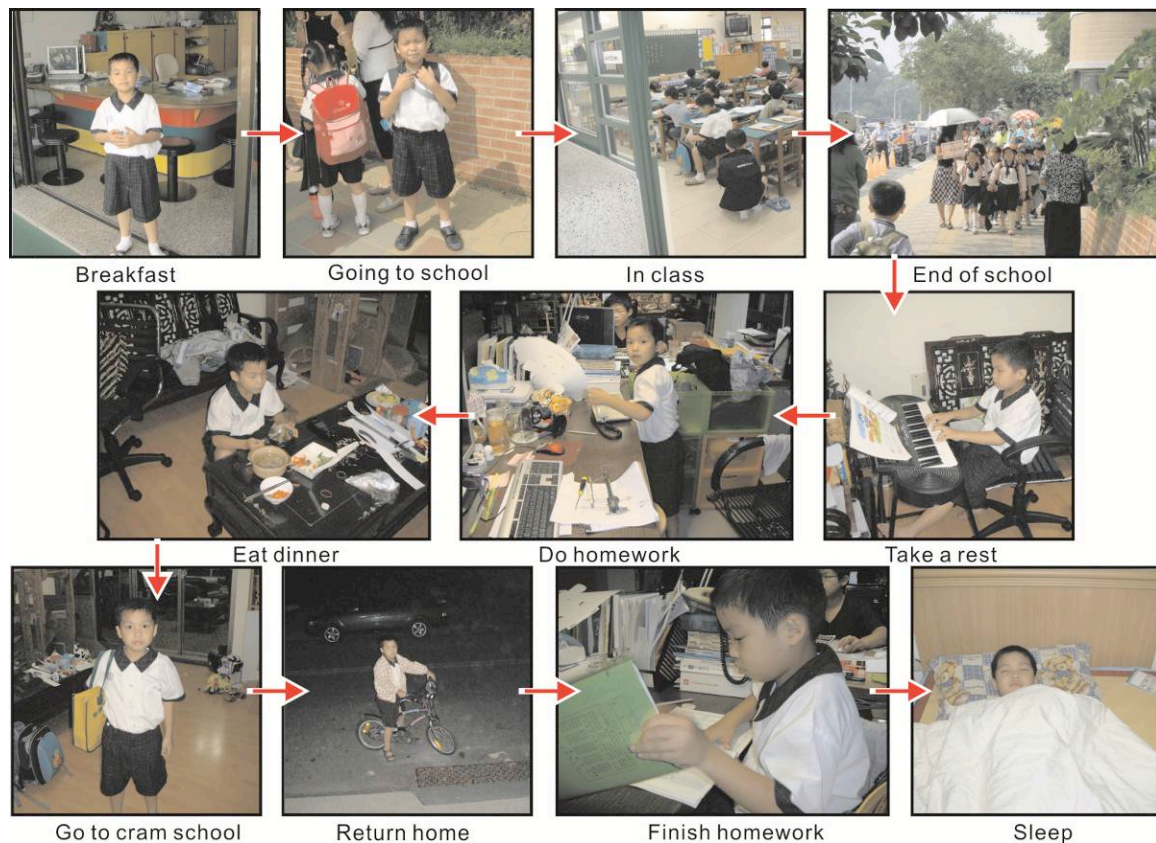


Figure 13.A 3<sup>rd</sup> grade elementary boy weekdays life documentary.



2. After I conducted interviews with my target group, I learned that children in this stage are starting to have a busy learning schedule. The survey shows that over 70% of children attend cram school, and some even have a full schedule on the weekends. All of the children that I had interviewed attend cram school. Considering the long hours spent studying and the limited ability to focus on one task for a period of time, I believe 30 minutes or less would be a good time frame for children to perform housework.
3. Finally, I believe children need more positive feedback from their parents to develop good work habits in the future. Therefore, a system that could assist parents to encourage their children to begin housework with a positive attitude is the start of developing good work habits.

### B. Housework

In terms of the research, practice in doing housework is a way for children to learn responsibility. However, the range of housework includes several levels; children start at a beginner level within their personal space to develop causal responsibility.

*Requiring children to perform work around the house is a widespread practice.*

*By the age of 7 years, children in most countries are involved in such work. -*

*Rogoff et al., (1975)<sup>11</sup>*

Even when the range of housework is reduced to a beginner level, there is still a great amount of housework chores from child to choose. I have provided some research below that can help me determine possible directions to take. The table below (*Figure 15*) shows that when 7 year olds are responsible for cleaning their own room, they can master more movements than their peers who are not responsible for their own room.

---

11. Rogoff et al.,(1975). Age of assignment of roles and responsibilities to children.

| Author\Age         | 2  | 3   | 4  | 5 | 6 | 7  | 8 | 9 | 10 | 11 |
|--------------------|--|---|--|---|---|--|---|---|----|----|
| Jones 1994         | 1. Help to bring things<br>2. Ring the doorbell<br>3. Find toys      | 1. Find the toy<br>2. Collect books<br>3. Help to put big things in the refrigerator<br>4. Empty indoor trash | 1. Put dirty clothes in the basket<br>2. Clean the restroom<br>3. Answer the phone<br>4. Turn off the TV<br>5. Organize toys |   |   | 1. Clean up your own room<br>2. Help to wash the clothes<br>3. Empty outdoor trash<br>4. Put dishes into the dish washer<br>5. Prepare snack<br>6. Collect books |   |   |    |    |
| 簡宛 (JAY-WENG) 1998 | 1. Bring the plastic cup to the container<br>2. Clean up little toys | 1. Make the bed<br>2. Put toys away<br>3. Help to wash the dishes<br>4. Wash the vegetables                   |  |   |   | 1. Fold the clothes<br>2. Vacuum the house<br>3. Mop the floors<br>4. Wash the dishes by yourself  |   |   |    |    |

Figure 15. Housework for different stage from Jones 1994<sup>12</sup> & Jay-Weng 1998<sup>13</sup>

|   |                              |  |
|---|------------------------------|--|
| How to Clean Your Room                    | Lorelei Sturkie              | <ul style="list-style-type: none"> <li>• Pick up and throw away all trash. Empty trash can.</li> <li>• Change sheets if needed and make bed.</li> <li>• Sort the clean clothes from the dirty ones. Put dirty ones in laundry bag.</li> <li>• Take laundry bag to laundry room for washing.</li> <li>• Put toys away, all parts of the same toy together.</li> <li>• Put away items that go in different rooms.</li> <li>• Make sure that clothes are hung neatly in closet.</li> <li>• Clean off all horizontal surfaces.</li> <li>• Put away anything that is left out on the floor.</li> <li>• Vacuum and use dusting brush. Clean dirty doorknobs, windows, door frames, and so on.</li> </ul> |
| 5 Necessary Tools to Organize Kids' Rooms | Sarah Aguirre (Housekeeping) | <ul style="list-style-type: none"> <li>• Closet Rod - lower the rod to about 4-6 inches lower than the height of your child.</li> <li>• Small Toy Bins - What do kids do when they want a toy? They dump them all out. Use smaller bins that allow toys to be sorted by type or use.</li> <li>• Hamper for Laundry - if your kid's room is piled high with dirty laundry, the problem may be the hamper.</li> <li>• Workable bedding simplifies your child's bedding.</li> <li>• Hooks can allow children to hang their own hats, bags, scarves, backpacks, and more.</li> </ul>   |
| Let's Get the Kids' Rooms Organized!      | Shiloah Baker                | <ul style="list-style-type: none"> <li>• Closet</li> <li>• Dressers</li> <li>• Toy Boxes</li> <li>• Schoolwork</li> <li>• Clothes</li> <li>• Shelves</li> <li>• Trash can</li> </ul>   |

Figure 16. Housework that children can handle in different stage<sup>14</sup>

12. Jones, R. D. (1994). Getting your kids to help Parents. Parents, 69(1), 121-124.

13. 簡宛 (1998). Children and housework, 105-109.

14. [http://housekeeping.about.com/od/childrensrooms/Childrens\\_Rooms.htm](http://housekeeping.about.com/od/childrensrooms/Childrens_Rooms.htm)

|           |                                      |                          |                          |                         |                         |              |                    |                     |                       |
|-----------|--------------------------------------|--------------------------|--------------------------|-------------------------|-------------------------|--------------|--------------------|---------------------|-----------------------|
| Housework | others                               |                          |                          | ★                       |                         | ★            | ★                  |                     |                       |
|           | Arrange the desk                     |                          |                          | ★                       |                         | ★            | ★                  | ★                   | ★                     |
|           | Dry clothes                          |                          |                          | ★                       |                         | ★            | ★                  | ★                   | ★                     |
|           | Wash dishes                          |                          |                          | ★                       | ★                       |              | ★                  | ★                   | ★                     |
|           | Make the bed                         |                          |                          | ★                       |                         | ★            | ★                  | ★                   | ★                     |
|           | Take care younger brother and sister | ★                        |                          |                         |                         |              | ★                  | ★                   | ★                     |
|           | Take care pets                       | ★                        |                          |                         |                         |              | ★                  | ★                   | ★                     |
|           | Clean room                           | ★                        |                          | ★                       |                         |              | ★                  | ★                   | ★                     |
|           | Throw trash                          | ★                        |                          | ★                       |                         | ★            | ★                  | ★                   | ★                     |
|           | Outdoor work                         | ★                        |                          |                         |                         | ★            |                    |                     |                       |
|           | manage                               |                          | ★                        |                         | ★                       |              |                    |                     |                       |
|           | Family activity                      |                          | ★                        |                         | ★                       |              |                    | ★                   | ★                     |
|           | Family care                          |                          | ★                        |                         |                         |              | ★                  | ★                   | ★                     |
|           | Choose clothes                       |                          | ★                        |                         |                         |              |                    |                     |                       |
|           | Take care of cloth                   |                          | ★                        | ★                       | ★                       | ★            | ★                  | ★                   | ★                     |
|           | Maintain                             |                          | ★                        |                         | ★                       |              |                    | ★                   | ★                     |
|           | Clean the house                      | ★                        | ★                        | ★                       | ★                       |              | ★                  | ★                   | ★                     |
|           | shopping                             |                          | ★                        |                         | ★                       |              | ★                  | ★                   | ★                     |
|           | Clean the table                      | ★                        | ★                        |                         |                         | ★            | ★                  | ★                   | ★                     |
|           | Prepare meals                        | ★                        | ★                        | ★                       | ★                       | ★            | ★                  | ★                   | ★                     |
|           | Study (age)                          | 2~17                     | 6~12                     | 6~12                    | 6~12                    | 2~12         | 11~12              | 10~12               | 11~12                 |
|           | Investigator (Year)                  | White&Brilnerhoff (1981) | Peters & Haldeman (1987) | Warton & Goodnow (1991) | Hilton & Haldman (1991) | Jones (1994) | Shin-un Lee (1998) | li-chung Dai (2003) | Shain-ren chio (2005) |

Figure 17. Housework that children can handle in different stage.



In *Figure 17* are tips from several experienced mothers, suggesting “how to keep a child’s room clean.” I have highlighted the tips that have been mentioned in all of the paragraphs, like hooks, trash can, laundry bag, and so forth. On the other hand, as shown in the table (*Figure 17*), the researchers who have studied children and housework have assigned housework according to age. My target age is 9 and older, so I have chosen research that focuses on older children and Goodnow’s research.

Housework that is appropriate for my research is emptying the trash, cleaning his/her own room, taking care of clothes, arranging the desk, and cleaning up toys.

### C. Environment space

A typical house space in Taiwan is one of the narrowest house spaces in the world. It is difficult for a family to provide a child with his/her own play space or individual room. The child’s space is typically part of the living room space, which must be shared with the family. In order to provide a successful solution, it is critical for me to determine a way to work with the space the child is allowed to use, especially when the space must be shared.



*Figure 18. Children’s rooms in Taiwan*

The pictures above show how many books, toys, furniture and clothes a child's room holds in Taiwan. Most of the spaces contain textbooks, school supplies, clothes, and toys. Assuming we can keep the things from all horizontal surfaces and organize the items in a vertical way to save space.



*Figure 19. Children play space in Taiwan family*



Figure 20. Taiwan family normal room layout

#### D. Summary

Based on my research and on feedback from my audience, I want to respond to their needs by not only fulfilling their requests but also incorporating more added values to the products. I set up some basic guidelines for housework:

- Who : Children aged 7-11(tall 110-140cm)
- Where: Children's own room, private space
- When : On their free time but not taking more than 30 minutes
- What : An aid that could encourage children to start cleaning
- Why : To teach children self-responsibility
- How : Using light, sound, and color, things that are playful and that attract children



In addition to the rules, there is one other consideration: the child's safety. Children aged 7-11 are refining their movements and working skills, and their muscles might not be fully developed. While in this stage, the product structure, weight, and material must be carefully selected to ensure the child's safety. The design must not contain any sharp corners, large or heavy pieces, or be so small that the child might swallow it.

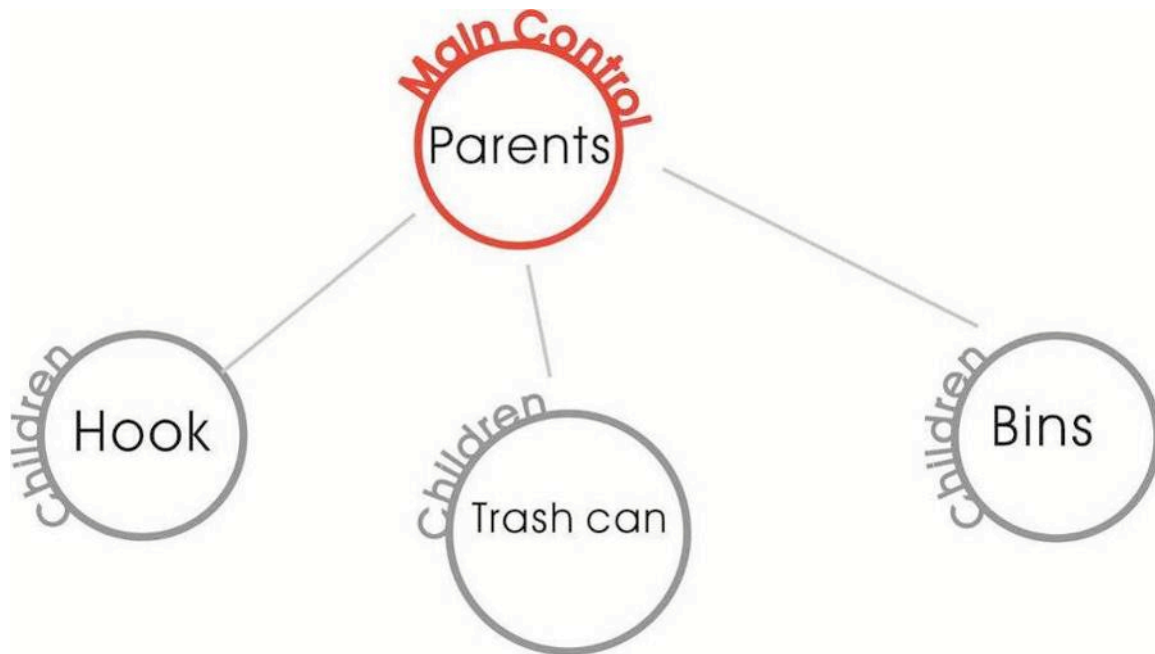
**A. System Concept**

From the analysis, I have chosen three household chores, which include the basic elements of keeping a child's room clean: emptying trash, taking care of clothes, and picking up toys. The main object for emptying the trash is the trash can. The question now is how to make the trash can and the user experience more attractive for children.

Taking care of clothes is the second element in keeping the room clean. One of the articles mentioned that in order to keep the room organized, all horizontal surfaces should be cleaned. Other articles point out that hooks are the most useful item to use in organizing a room. Consequently, using hooks to keep things in a vertical direction could save a lot of space.

How to organize toys, of which every child seems never to have enough, is a major issue for a family.

On top of these concerns, further research revealed that parents play a major role in a child's life, especially as he/she is growing up. The design that I want to develop is a system that will assist parents in guiding their children on how to do housework, with the objective being to establish good work habits.



*Figure 21. The basic structure of the system of this project.*

## **B. Possible Directions**

- Use elements that attract children, such as movement, light, sound, and color.
- It should “prompt” children to perform the day’s household chores.
- It should be able to combine into different forms, variations, or be playful and creative.
- It should be simple to use, not some high technology item that requires the child to study a guidebook to be able to use it.
- It should have sound effects that remind parents to be patient and that alert children when to start working.
- Parents should have primary control of the system; however, they need to work with their children to make the device suitable for them. It should be a communication system between parents and children.

### C. Preliminary Concepts

#### 1. Hooks

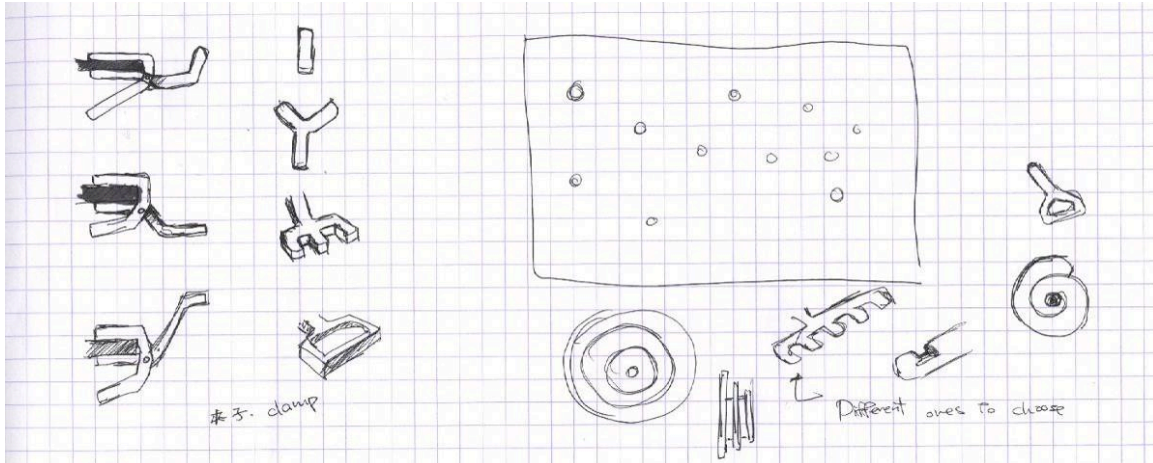


Figure 22. Concept Sketch of the hooks

- Use different shapes to make hooks, similar to a Y or L shape.
- The child can place the hooks anywhere on the board he/she wants in order to create his/her own space.

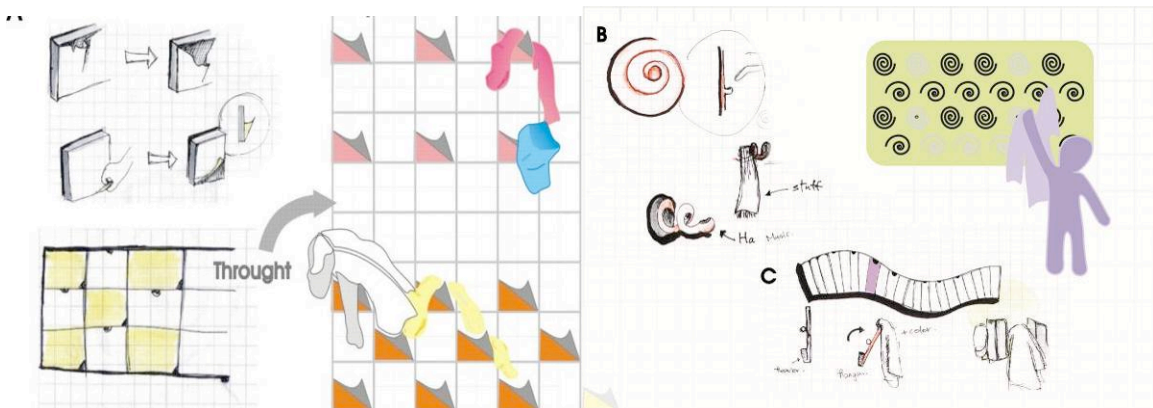


Figure 23. Concept Sketch of the hooks

- The design is based on the child's habitual behavior, such as peeling (sticker or label), throwing.
- The hooks can react after the movement, similar to a piano.
- The hooks might also provide a decoration for the wall or a portion of the wall.

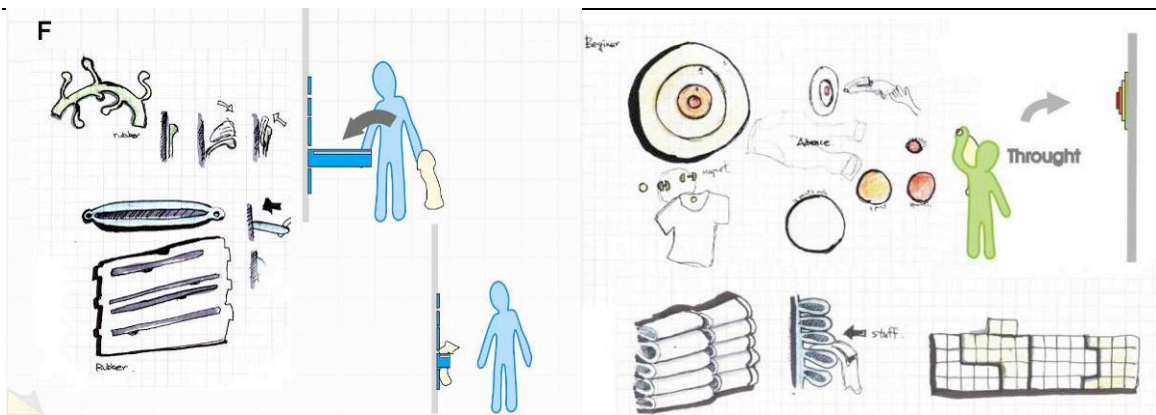


Figure 24. Concept Sketch of the hooks

- Use magnetic force to explore ideas; easily controllable magnets are always great elements to use in the design of playful items.
- Stuffing things is a habitual behavior of children; this action could inspire several designs.

Rubber is another item that children like to play with; it has inspired me to create different forms.

## 2. Trash can

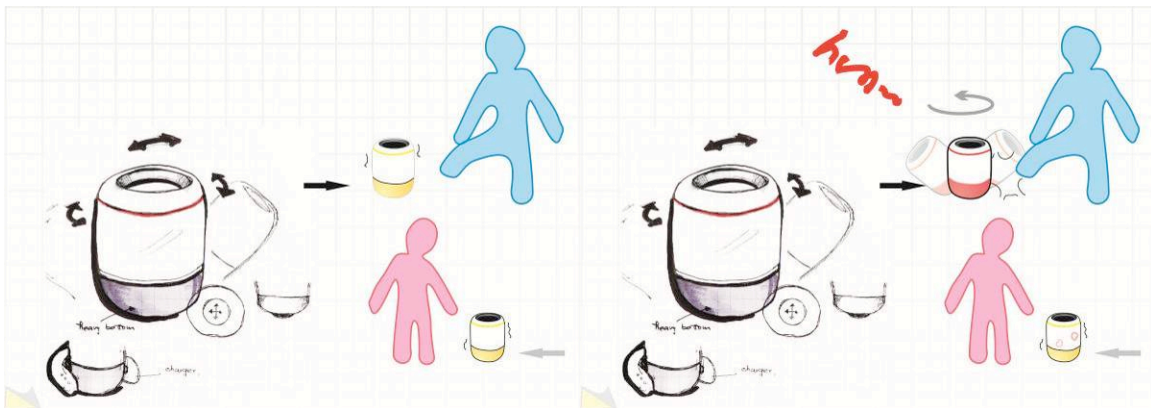


Figure 25. Concept Sketch of the trash can

- When an object gives children feedback, they find it more attractive.
- Use elements like sound, movement, light, and color to grab children's attention.



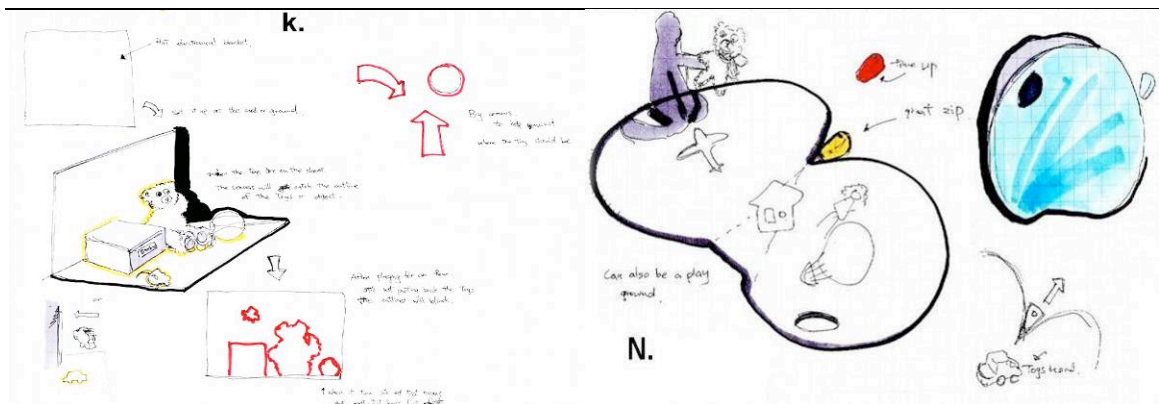


Figure 28. Concept Sketch of the bins.

- Explore ideas from pet actions, transforming them into the experience of throwing away trash.
- Use the play area as a different form of a bin, combining two uses in one design.
- “K” in the figure has a timer to record play time; when the time is up, the light will flash.

At this point, to determine whether the ideas have potential, I have chosen some of the designs and made them into mockups for testing to ensure that the models will work in the future.



From the following sketches, I use different materials to process the design, from sponges to metal, pencils, and so on in order to learn which material is safest and strongest to use in a product designed for children.

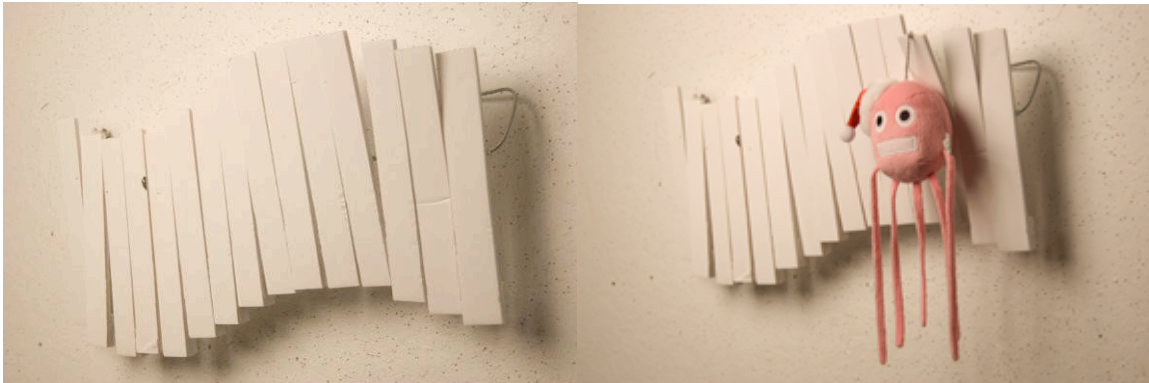
### Hooks mockup



*Figure 29. Mockup of the three different concepts of hooks*

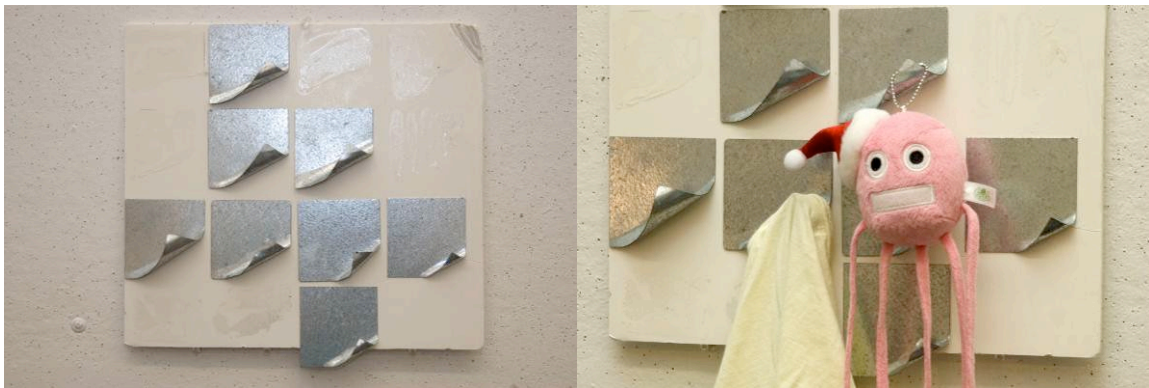
- All three models are based on the idea of children creating their own hooks.
- Recycle old pens, pencils, or sticks, and turn them into hooks.
- With a squeezing movement, the sides of the sponges will hold clothes.
- The metal can hold objects and will retain its shape when it has been peeled.





*Figure 30. Mockup of the Piano style hook*

- When an item has been hung, the hook will move and the user will receive feedback.



*Figure 31. Mockup of the corner hook*

- Hooks can become part of the decoration of the house.

### Trash can mockups



*Figure 32. Mockup of the tumbler trash can base part*

Through the idea process, the tumbler trash can received more positive feedback than the other designs. In this stage, I focus on the base. Trying to get the correct radian for the product to hold the weight of the trash and not topple is a challenge.



*Figure 33. Mockup of the tumbler trash can base part, different radian detail*

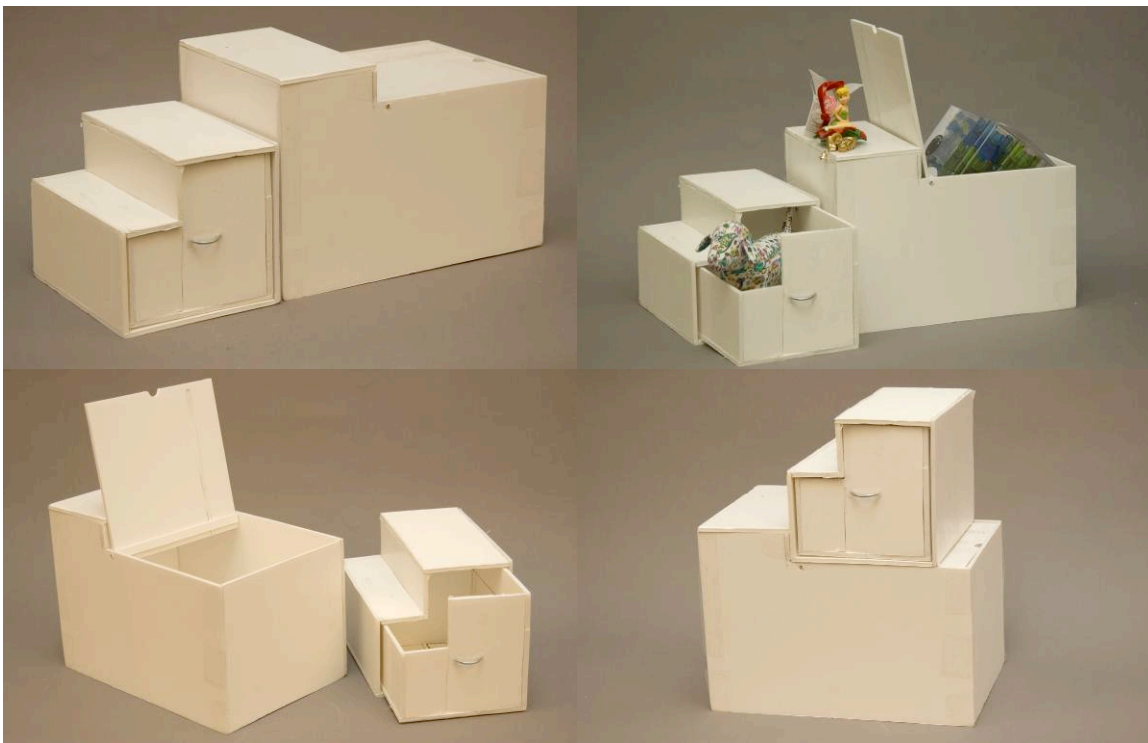


*Figure 34. Mockup of the tumbler trash can base “how it tumbles” detail*



*Figure 35. Mockup of the tumbler trash can base “how it tumbles” detail*

### Bins mockup



*Figure 36. Mockup of the toy storage bins*

- With bins made like building blocks, children can arrange them however they like and use them as a piece of furniture.





*Figure 37. Mockup of bins and play space combination*



*Figure 38. Mockup of bins and play space combination size comparison*

- When the bag is placed on the floor, it provides a play space for children.
- The sketches in the bag are memos for the child to remind him/her where to put the toys.



*Figure 39. Mockup of bins and play space combination*



*Figure 40. Mockup of bins and play space combination*

- Easily clean up in two steps, and the child can organize the toys on the wall.
- The bag can be used from both sides to separate each child's toys.

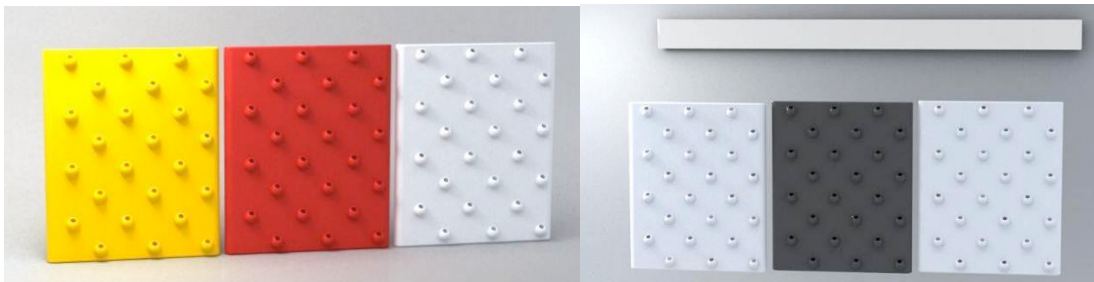
During this stage of the design process, I became aware of the fact that after testing some of the models, there were some design issues, such as cleaning and repairing, which are two important issues that parents care about. This stage of testing has improved and refined my concepts.



Due to the limits of the models and testing, I chose three designs from the mockups to generate into prototypes. To ensure that the overall design details meet the requirements of both the parent and child, I have made 3-D models first to be sure of the size and form.

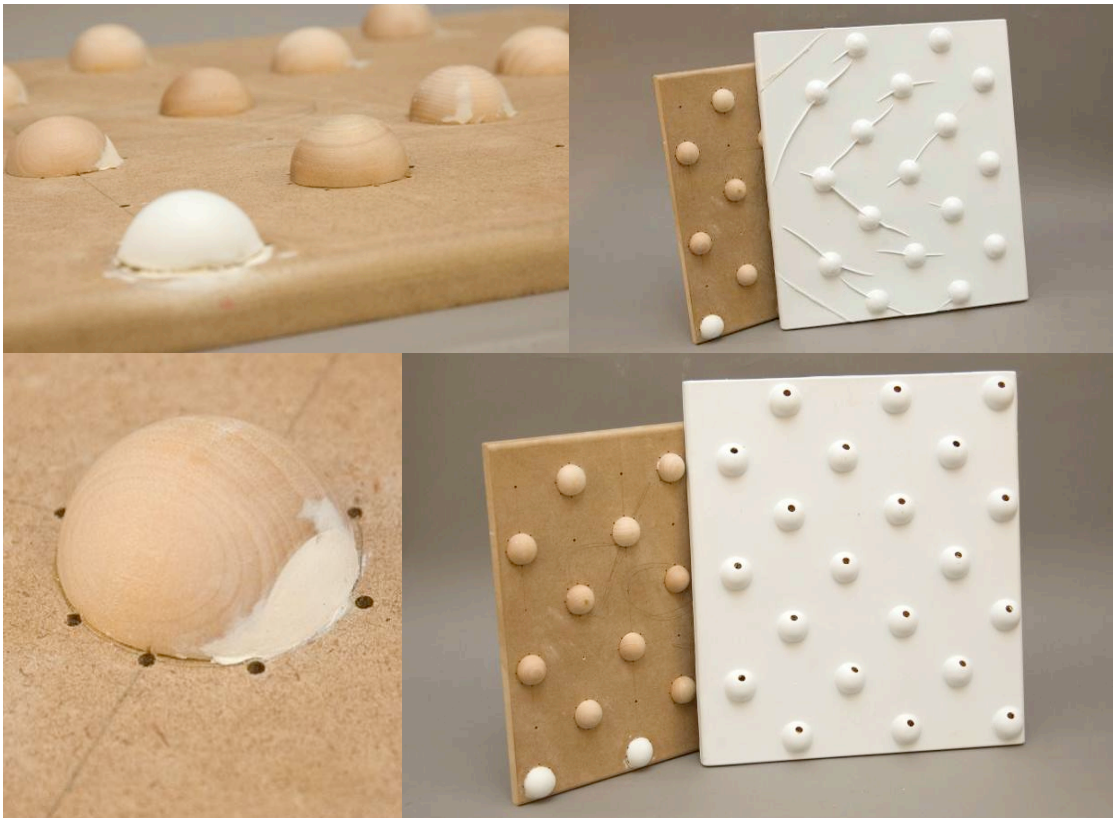
### Hooks

- **3-D model**



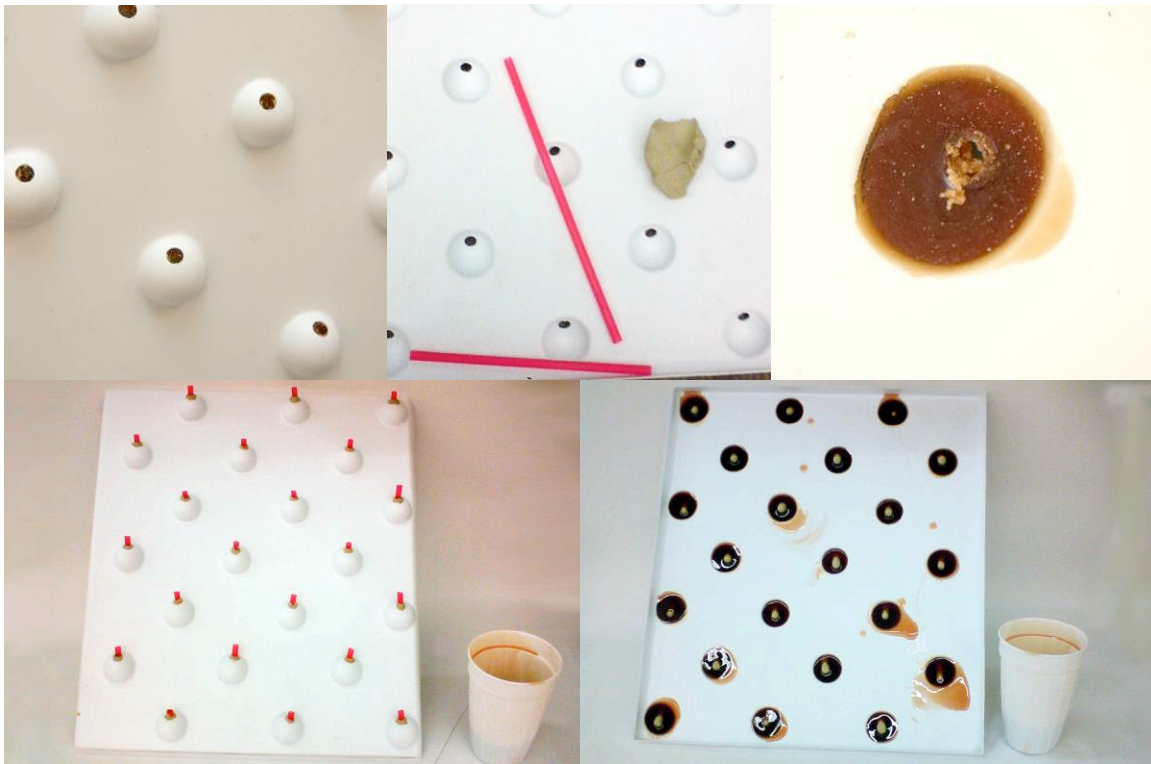
*Figure 41.3D model build and rendering with Rhino*

- **Model**



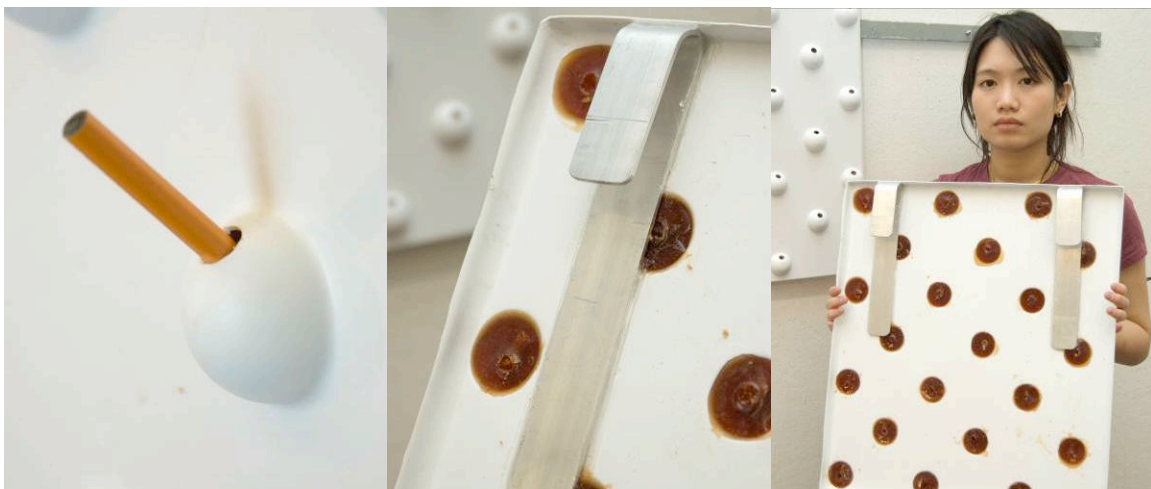
*Figure 41.Hooks prototype process*

During the prototype process on the base mold, I missed some particulars, which caused flaws on the first model. In Fig. 41 shows that to vacuum halfway around shapes, we need to bore holes around the shape to avoid flaws caused by air.



*Figure 42. Hooks prototype process filling the holes with silicone*

- In order to hold different sizes of pens, I used flexible silicone to fill the holes.



*Figure 43. How the silicone holds on the pens and the aluminum hook on the back*





*Figure 44. The size of the hook*

- To ensure the weight and safety, the hooks on the back are made from aluminum.
- Fig. 44 shows the hook size in comparison to a child who is 140 cm (4'6").

On the hook prototype, people will use different colors of pencils, pens, and chopsticks to create hooks or place them in different shapes, such as a circle or square, to make them creative and special. When testing the strength of the hooks, the prototype could hold over 20 pieces of clothing.

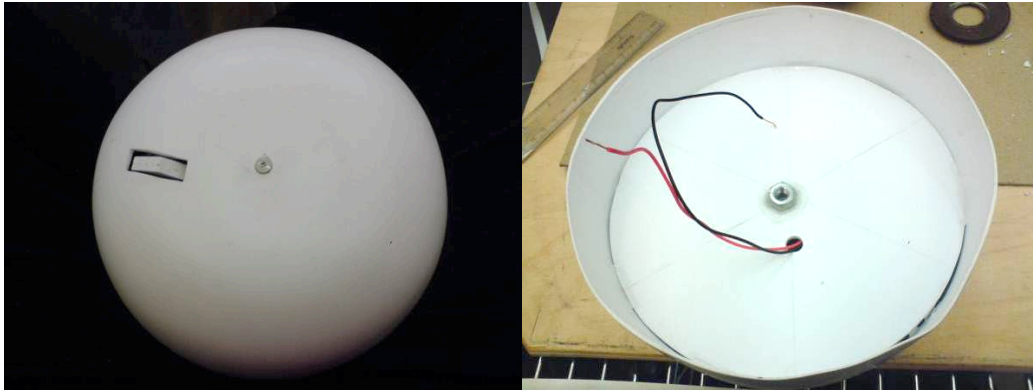
## Trash Can

- **3-D model**

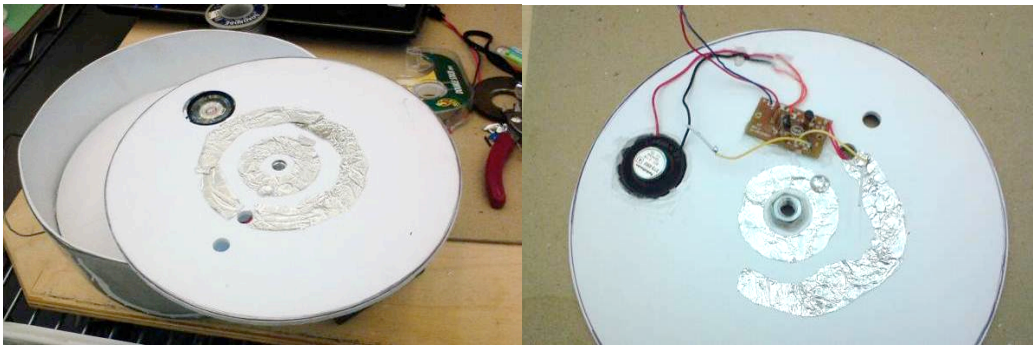


*Figure 45. Trash can 3D models built with Rhino*

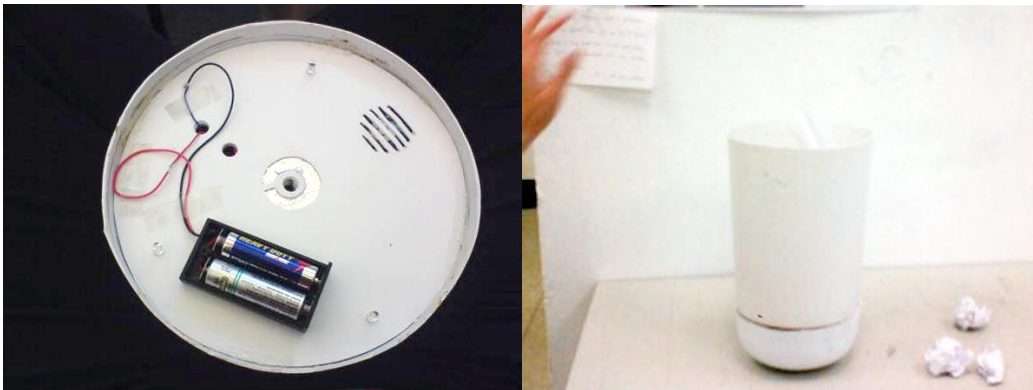
- Model



*Figure 46. Developing the tumble base*



*Figure 47. Adding sound chip and audio*



*Figure 48. Motion sensor on the edge to sense people throwing trash into the trash can*

In this model, I tried to attach the entire system to one battery case to reduce any extra weight and also used a hexagon wheel to create the tumble movement that occurs when people throw trash away. When a person tosses trash into the trash can, it will respond with a tumble movement and sound.



*Figure 49. Using rotating system to create a tumble movement and also showing the audio*



*Figure 50. On the edge also is added LED light to create more attraction.<sup>14</sup>*

One of the objectives is a device that could serve as a communication board between parents and children, so I searched for a more suitable material. The “Jonisk floor lamp”<sup>15</sup> from IKEA is a product that tumbles perfectly and uses acrylic for the shield. Acrylic, after coating, is a material that can be written on, so people can leave a message on it. Therefore, I used this lamp to build another prototype for testing.

15. **Jonisk floor lamp** ( <http://www.ikea.com/us/en/catalog/products/10053291/>)



## Bins

After getting parents' opinions of the bins, I learned that it is difficult for them to choose one specific bin to use for toys because the house space is limited. However, all of the parents require that the child be able to clean up the toys; therefore, I redesigned the toy cleanup part using the details from drawing "K" in Fig. 28, particularly the timer and sensor parts. The sensor is a device that could be used on any kind of box or bin, and the timer can be placed on any wall in the house.

- **Model**



Figure 51. Toy cleaning timer and sensor mockup

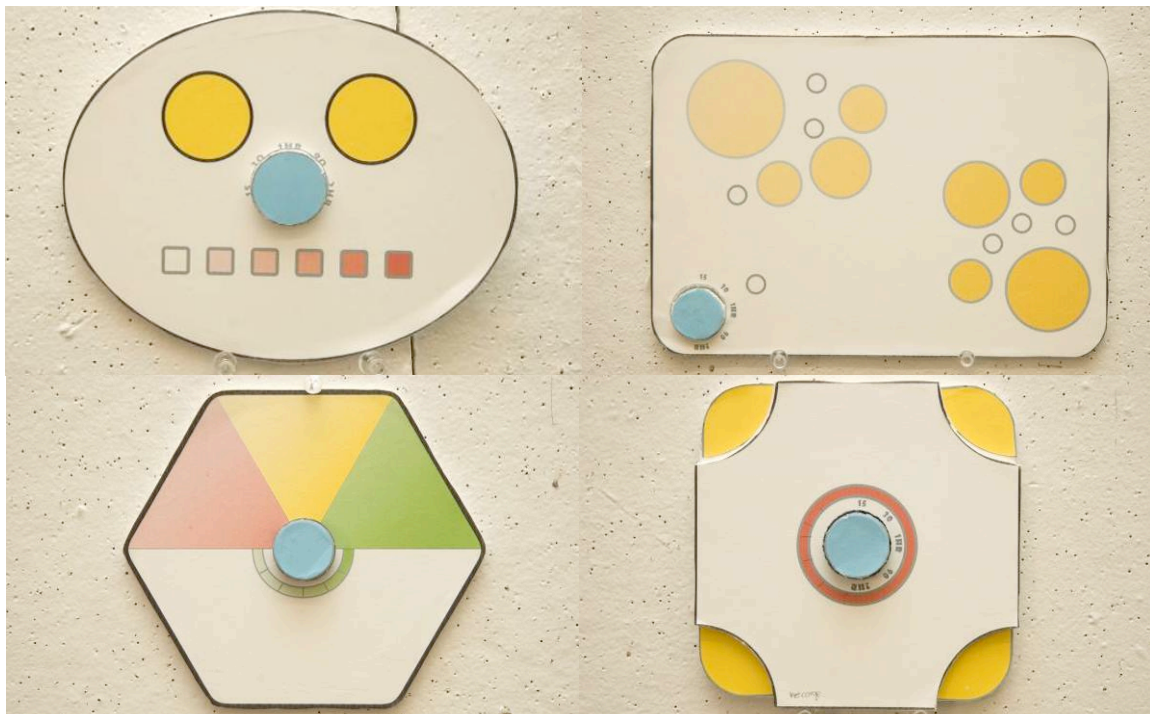
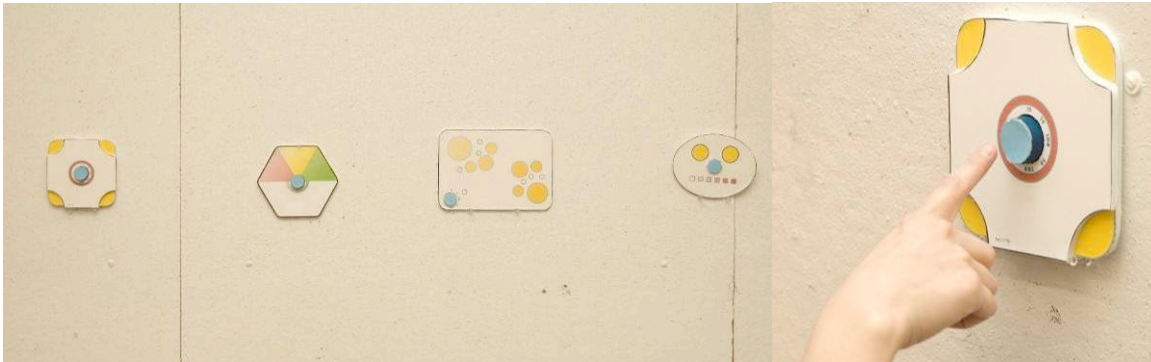
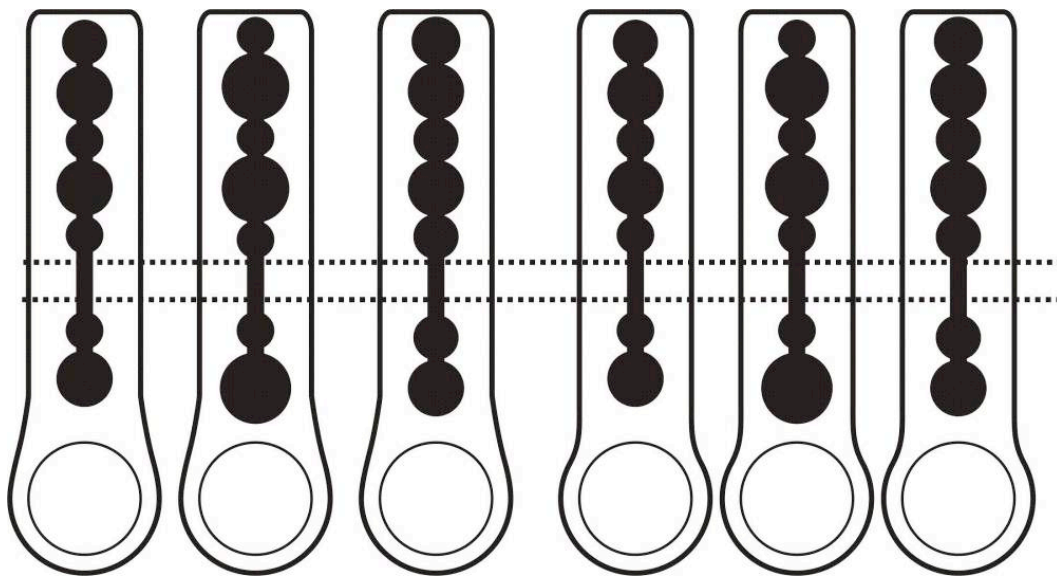


Figure 52. Different forms for the timer



*Figure 53. The size of the sensors*

- During countdown, the timer would use sound and the light would change colors to remind the child.



*Figure 54. Solar charger form for the sensor*

- The sensor is charged by a solar cell and a lithium battery. Both work together like a calculator, which would work for a period of time.

In choosing the final approaches, I considered the following criteria: First, it is an interesting and unique way for children to start learning about cleanup. Second, it is a communication unit for parents and children. Accordingly, these are the three solutions I have chosen for my design.

This step is important in my project because parents and children participate together using this system, which means they create their own system in a unique way by using different music, memos, colors, and so on. The feature that separates this product from the original hook or trash can is that people can add a personal touch to make it unique and special. People also cherished the interaction between parent and child during the creative process.



*Figure 55. Children experience with the hook*

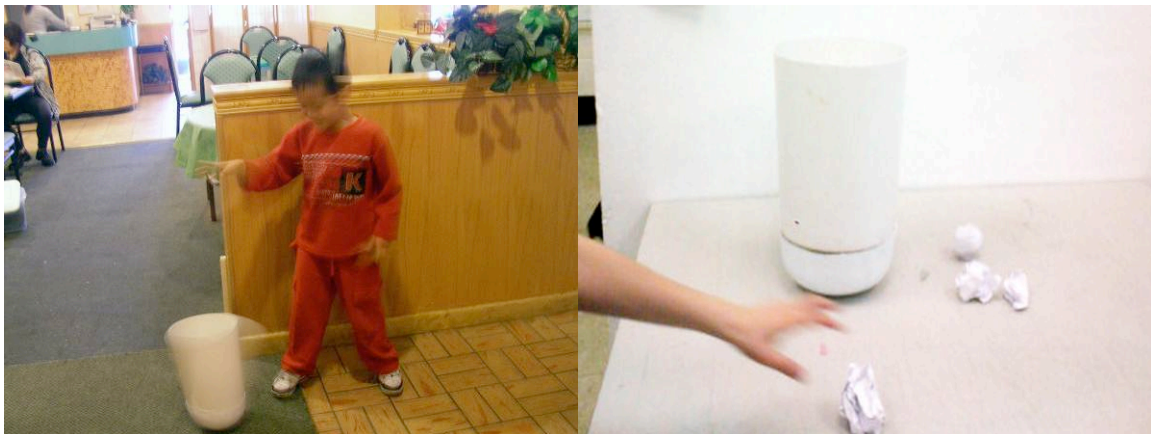
- The sensor is charged by a solar cell and a lithium battery together.



*Figure 55. Children experience with hook and tumbler trash can*

- Children were excited by the tumble movement of the trash can.





*Figure 56. Children experience with tumbler trash can*



*Figure 57. Children and parent experience with second tumbler trash can*

- Parents like the second trash can more because it is steadier.



*Figure 58. Parent experience with toy cleaning system*

Feedback from children and parents:

| Item                     | Positive opinions  | Areas of opportunities  |
|--------------------------|--|---|
| <b>Hooks</b>             | <ul style="list-style-type: none"><li>• Creative</li><li>• Saves space</li><li>• Like that parents can leave notes on the board</li><li>• No sharp corners</li></ul> | <ul style="list-style-type: none"><li>• It is a bit oversized for a child to hold</li><li>• Pencils might not be strong enough to hold clothes</li><li>• It could combine more pieces</li><li>• It could be more colorful</li></ul> |
| <b>Trash can</b>         | <ul style="list-style-type: none"><li>• Tumble movement attracts children</li><li>• Like the sound it makes when throwing trash away</li></ul>                       | <ul style="list-style-type: none"><li>• The base needs to be more steady</li><li>• It should use a rechargeable battery</li><li>• It should have a part to hold the trash bag</li></ul>   |
| <b>Toy Cleanup (Bin)</b> | <ul style="list-style-type: none"><li>• It can fit any bin or storage unit in the house</li><li>• Has light and music to remind children to clean up</li></ul>       | <ul style="list-style-type: none"><li>• The timer size could be bigger to allow parents to write a note on it</li><li>• If the battery is built in, it should be rechargeable</li></ul>   |

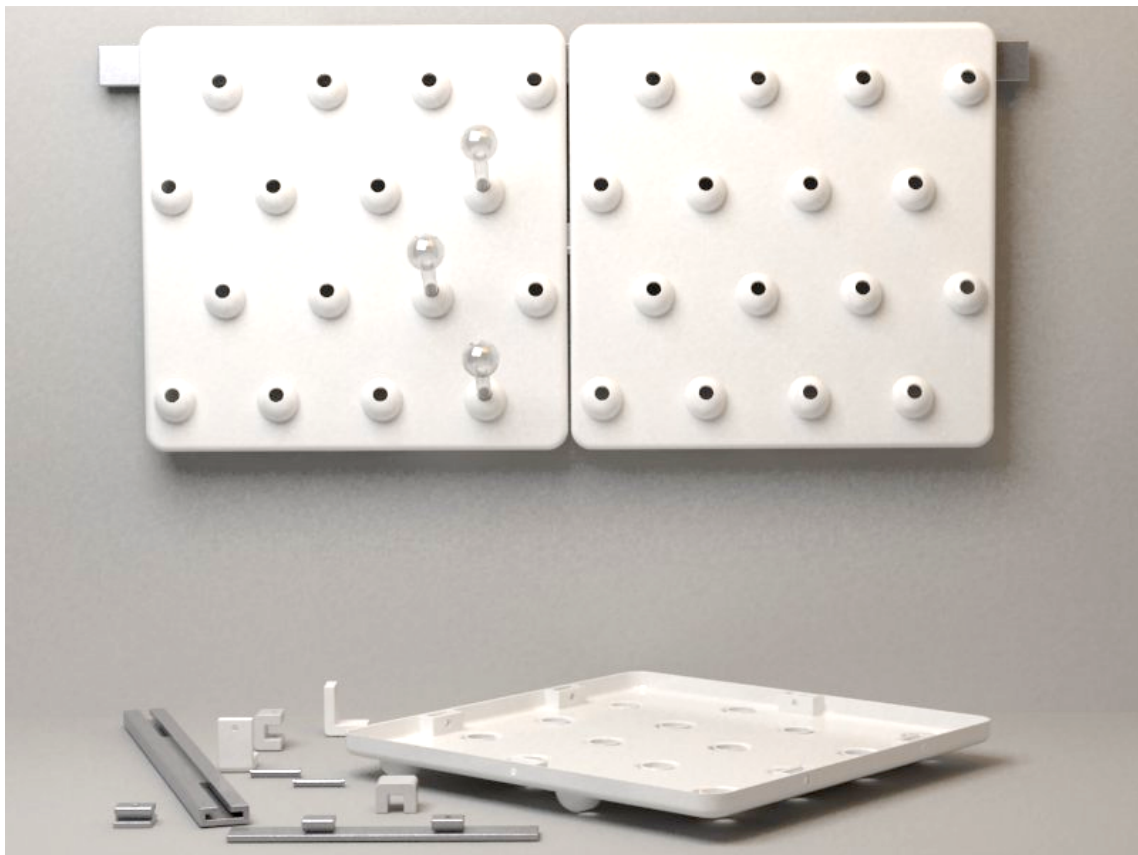
During this process, parents and children experimented with the system. I was frequently asked why I did not design a product that would clean the house instead. In my opinion, teaching children how to clean is better than cleaning for them. To prompt and encourage children to start learning how to do housework is my main objective, which I mention in the “Situation Analysis.”

To achieve my goal, I will improve the system and products to satisfy the high expectations of the parents and children. I had considered using a plain color on the products so that the children could add a personal touch to them.



In the interviews, although the products received positive feedback, their size still raised some concerns about the amount of space they might take up in the house. At this stage, I decided to focus on reforming the designs, with priority placed on the children's safety, and readjusting the weight and size so that they are safe for children to handle alone.

### Hooks



*Figure 59. Final model of the hook system*

This system includes the following four parts:

- A.) Four pieces for the main hook board
- B.) A set of mounting bars
- C.) Attachment hinge set (includes screws and hinge)
- D.) Hook pins

## A.) Hook Board

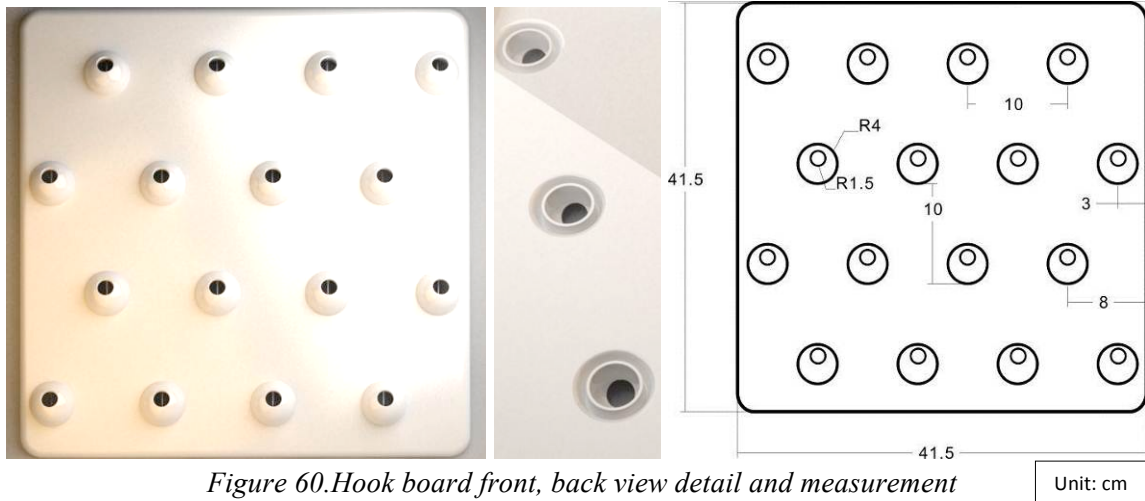


Figure 60. Hook board front, back view detail and measurement

- The middle picture shows the silicone-filled place; to save material, I have only filled in the middle.
- The size of the board has been reduced by 10% from the original design, which is more suitable in Taiwan and is a lighter weight.

## B.) Mounting bar set

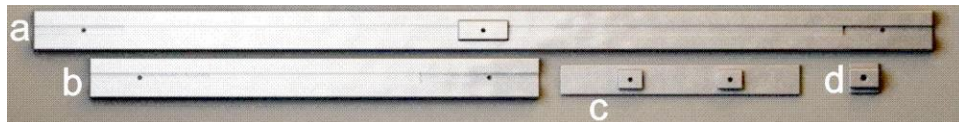


Figure 61. Mounting bar set parts

- The main mounting bar is 90 cm long (35.4") and will hold two hook boards.
- A shorter mounting bar is 45 cm long (17.7"), which is half the size of **a** and is meant for a smaller space.
- This is a combination bar; to combine **a** and **b**, to keep the bar strong enough to hold clothes and also be able to extend the length.
- Mounting pieces maintain space between the wall and the bar so the board can hang.

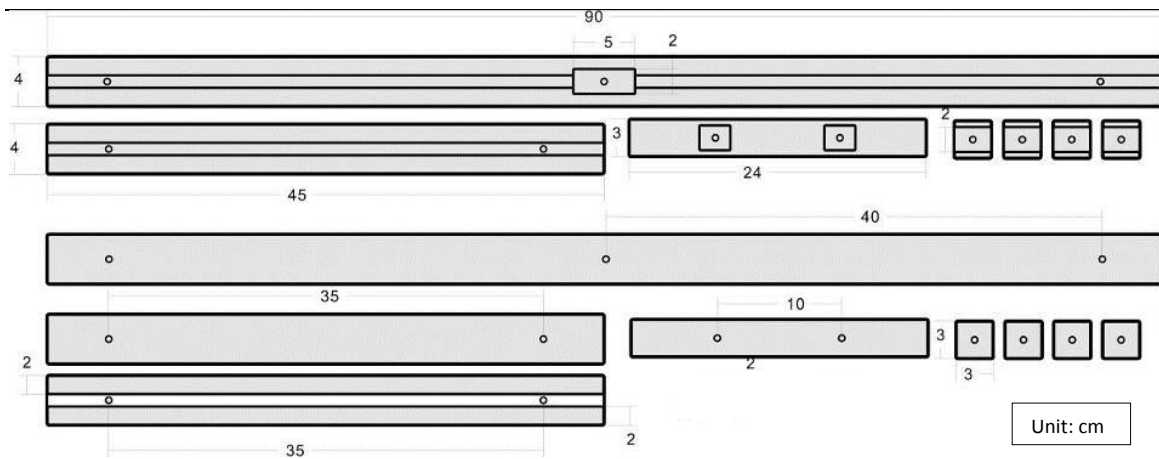


Figure 62.Measurement of the Mounting bar set parts

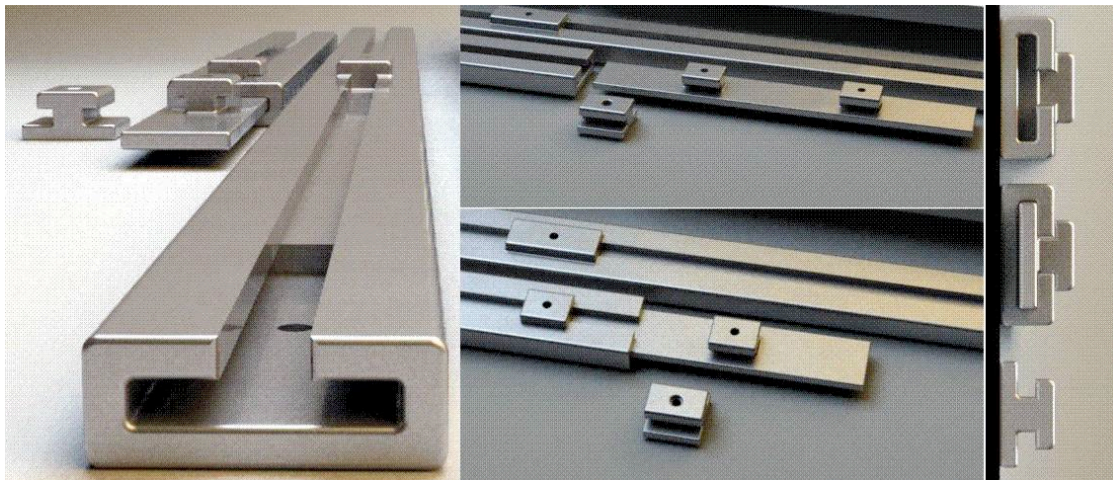


Figure 61.Mounting bar set detail

- Slide piece **c** into **a** and **b** to combine, and then use screws to attach the bar on the wall.

## C.) Attaching the hinge set

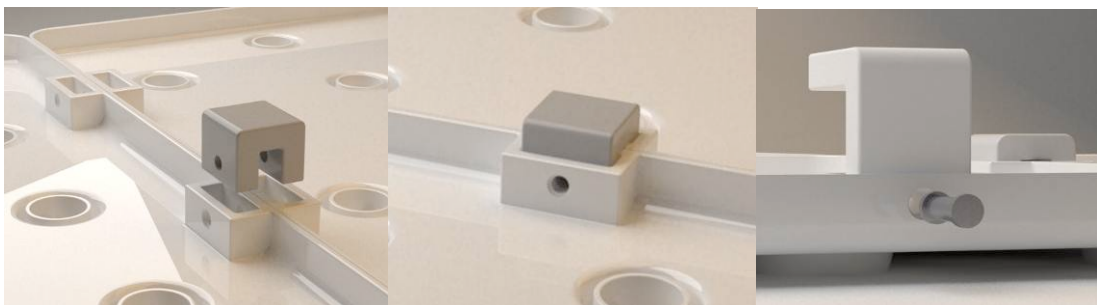


Figure 62.Hinge set detail

- The hinge is used to attach the hook boards the way the child prefers by using a U-shaped block and a screw.

## D.) Hook Pins



Figure 63. Hook pin detail and measurement

- The hook pins are made of acrylic and are safer than pencils. Any color can be placed in them.

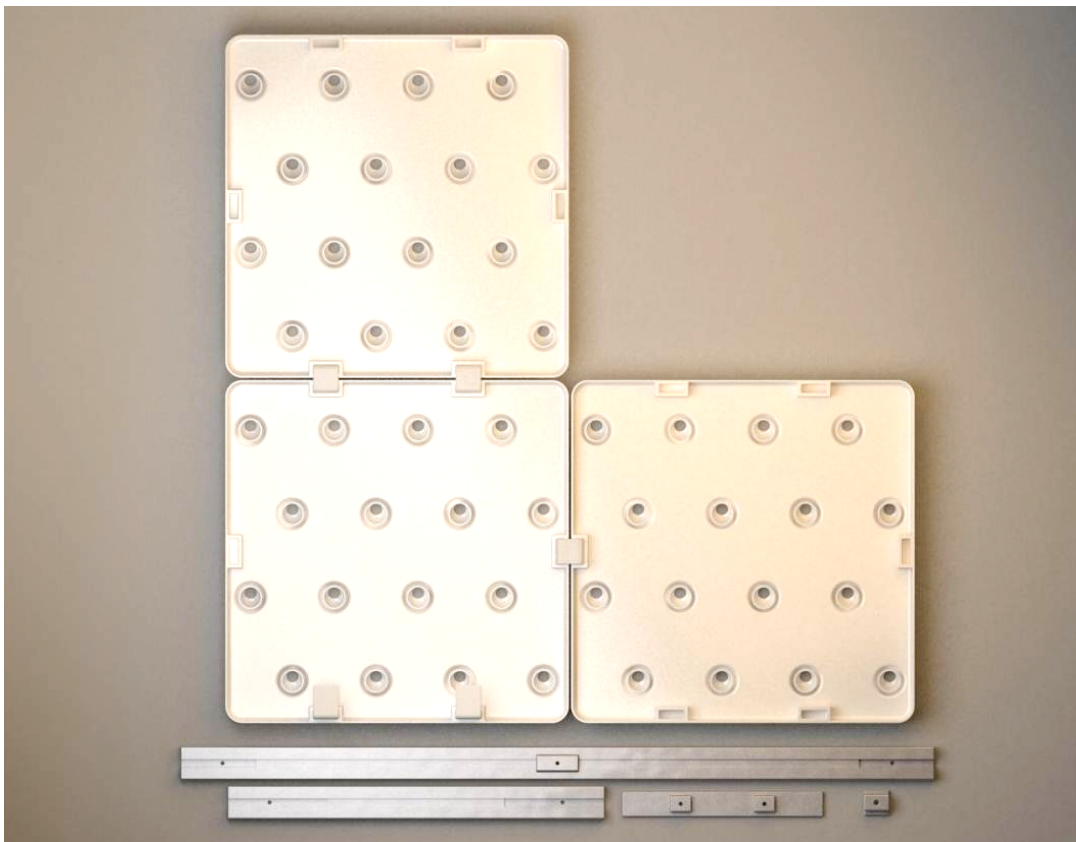
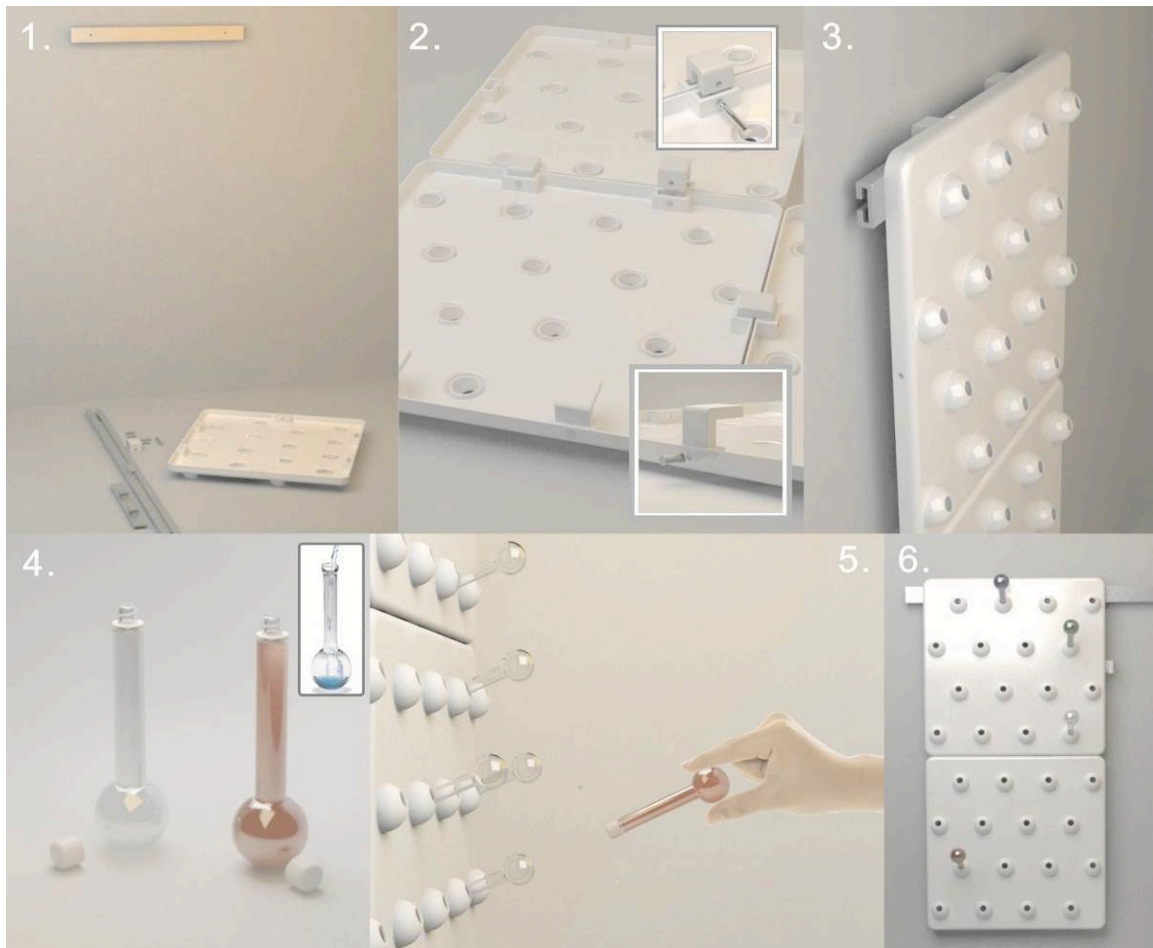


Figure 64. The back view of the set of hook



## How to use



*Figure 65. Step-by-step showing the usage of the hook*

- 1) Set the height for the hooks, and attach the mounting bar to the wall.
- 2) Combine the hook board into the shape you want by using the hinge.
- 3) Hang the hook board on the bar, and make sure it is steady.
- 4) Create the pins. The child can fill the pins with colored water, sand, paper scraps, or even glitter—whatever attracts his/her attention.
- 5) Decide where you will place the pins.
- 6) Make sure the pins are steady and all of them are in the right places.
- 7) Start to hang clothes on them.



*Figure 66. Children adding more personal touch on the board.*



## Toy cleanup set

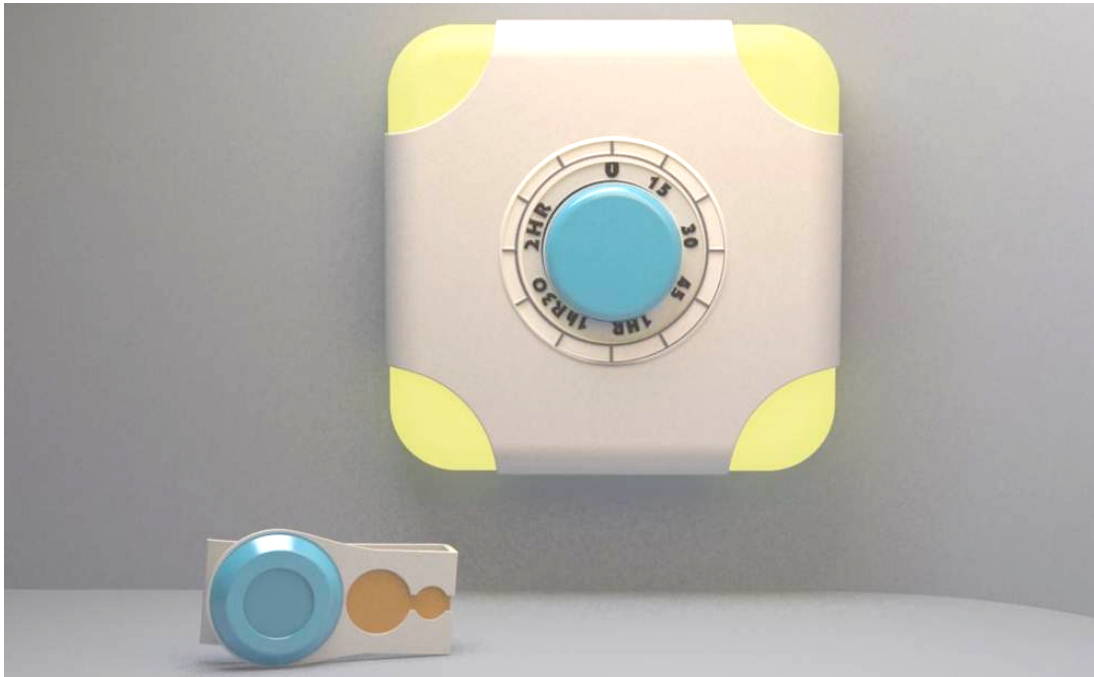


Figure 67. Toy cleaning set sensor and timer

This system includes the following four parts:

A.) Timer

B.) Sensor

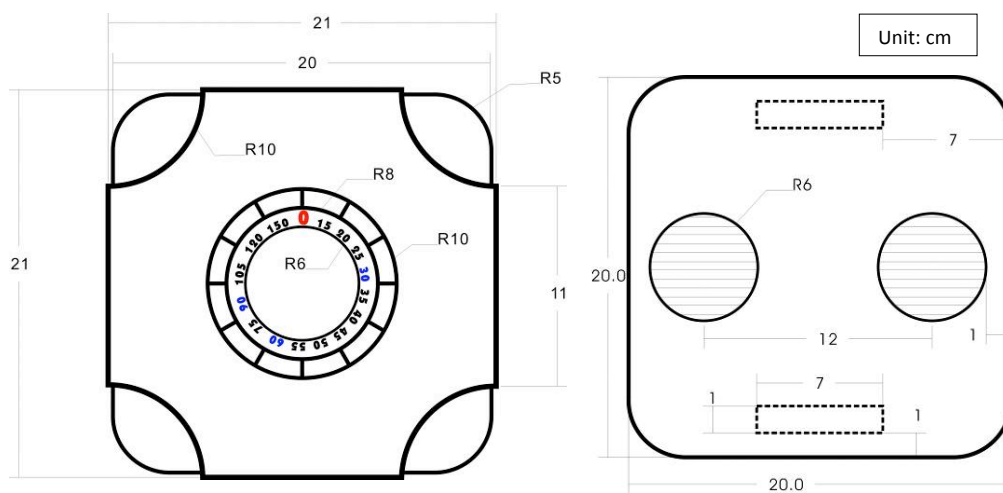
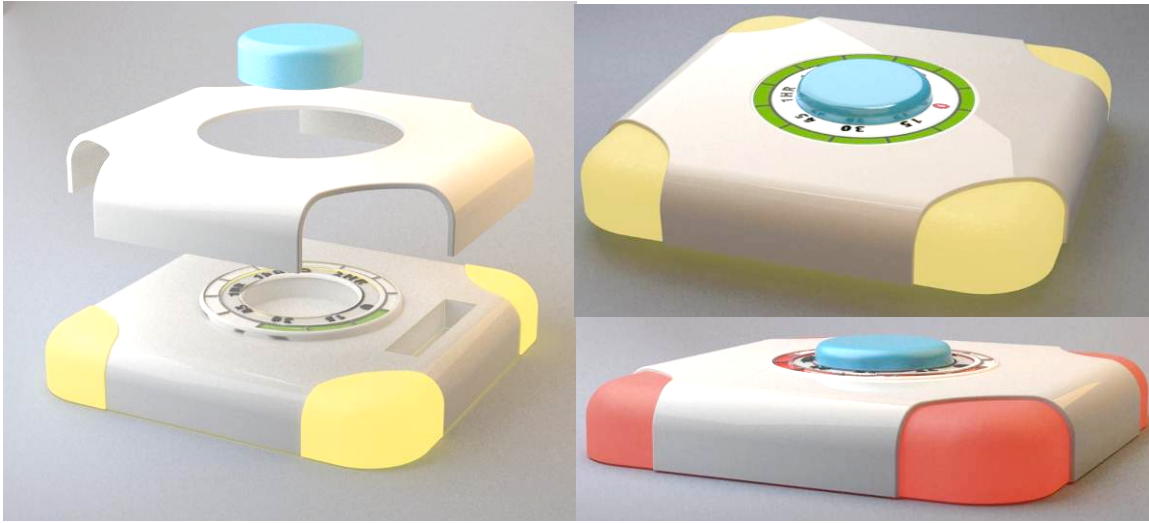


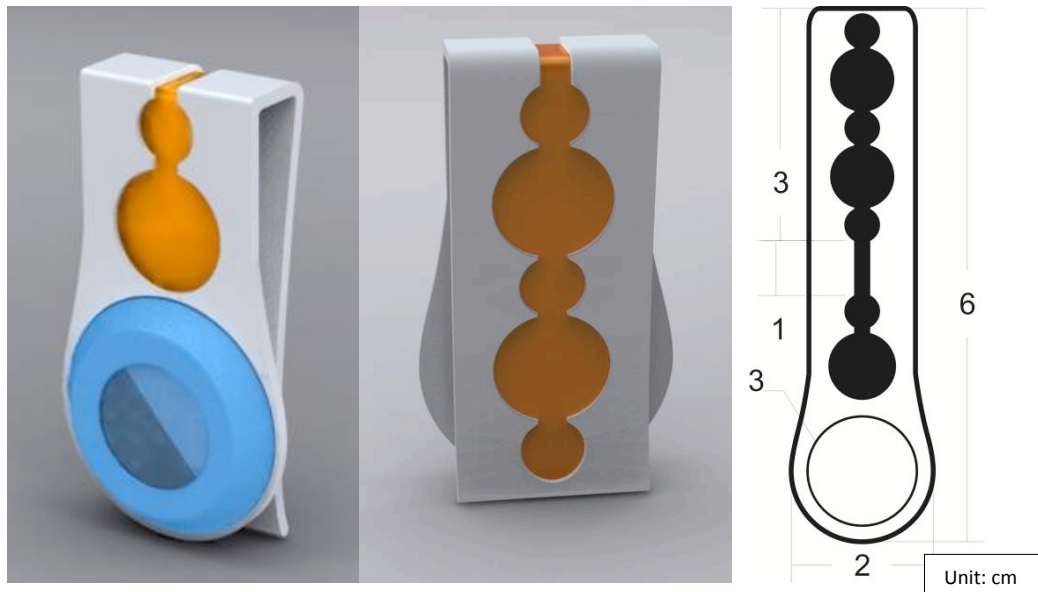
Figure 68. Sensor front and back view with measurement

- The speakers are on the back; the device requires some space between it and the wall.



*Figure 68.Timer explode view and detail*

- The battery is placed in the shield, making it safer for children.



*Figure 68.Sensor front and back view with measurement*

- The sensor is in the blue cap; therefore, when a parent sets the sensor, he/she needs to keep the blue cap facing inside the storage unit.
- The sensor uses a lithium button cell battery, along with a solar cell similar to a solar calculator, allowing it to be used for a longer period of time.
- More flexible material, such as ABS, was used for this device, allowing the clip to mount to any type of storage unit

### How to use

#### -First situation

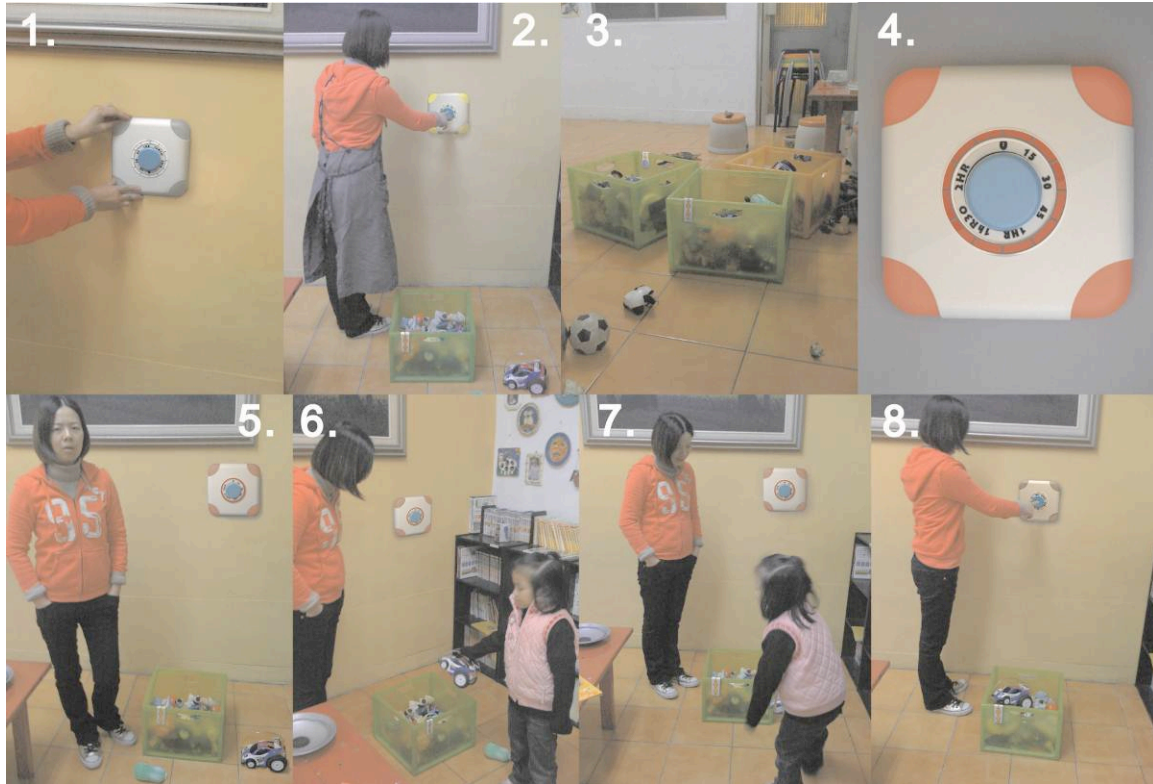


*Figure 69. Step-by-step how to use the toy cleaning set*

- 1) Place the timer on the wall with the double-sided foam tape on the back.
- 2) Turn the blue button to set the time the child is allowed to play, and then push to start.
- 3) Set the sensor at the edge of the toy box.
- 4) When the time is up, there will be a 20-minute interval to allow the children to start cleaning up, and the device will play a song to remind the children.
- 5) If the child starts cleaning up during this period, the device will play the song that the parent has chosen to encourage the children.
- 6) The room is clean.

## How to use

### -Second situation



*Figure 70. Step-by-step how to use the toy cleaning set*

- 1) Attach the timer to the wall by using double-sided foam tape on the back.
- 2) Turn the blue button to set the time for the child to play, and then push to start.
- 3) Put the sensor at the edge of the toy box.
- 4) During the 20-minute interval, if the child decides to ignore the reminder, the timer will enter the next level and will make a louder noise and flash a red light to catch the parent's attention.
- 5) Parents will notice that the children have not cleaned up the toys.
- 6) The parents need to make sure that the children start to clean up now.
- 7) Finally, the children clean up the mess they have created.
- 8) Parents can turn off the timer by pushing the blue button again, and now the room is clean.



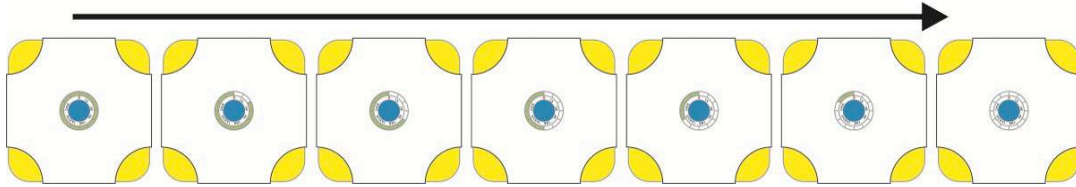


Figure 71. Showing step 2 “How the timer countdown time”

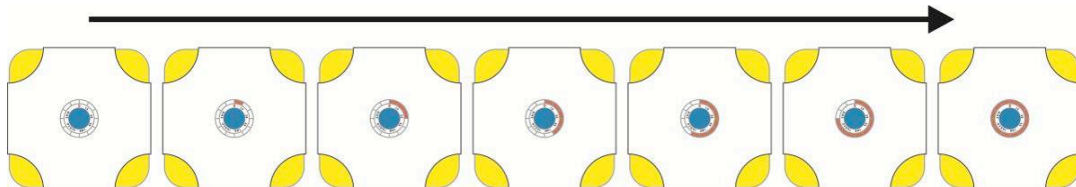


Figure 72. Showing situation 1 step 4 “The countdown between the 20min interval”



Figure 73. Showing situation 2 step 4 “when children don’t clean up countdown”

- Is this stage, the music will sound like a police car or ambulance and the red light will flash to create a more urgent warning to warn the child.

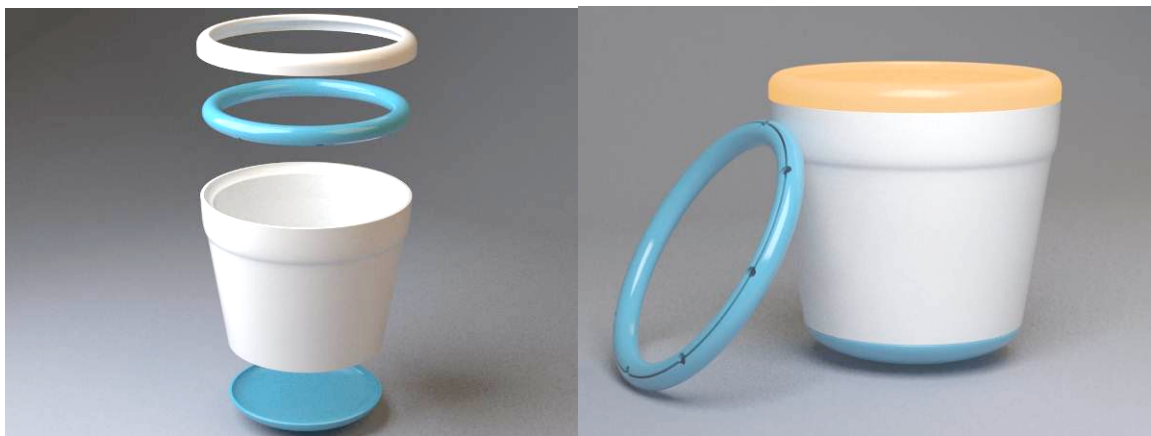


Figure 74. The timer set up in the room when the child is playing

### Trash can



*Figure 75.Final model of the Tumble Trash can*



*Figure 76.Exploded view and detail of the trash can*

This system includes the following parts:

- A.) A trash can base, which includes the motor and battery to create weight
- B.) A loop that holds the trash bag in
- C.) The top lid, which has LED in it



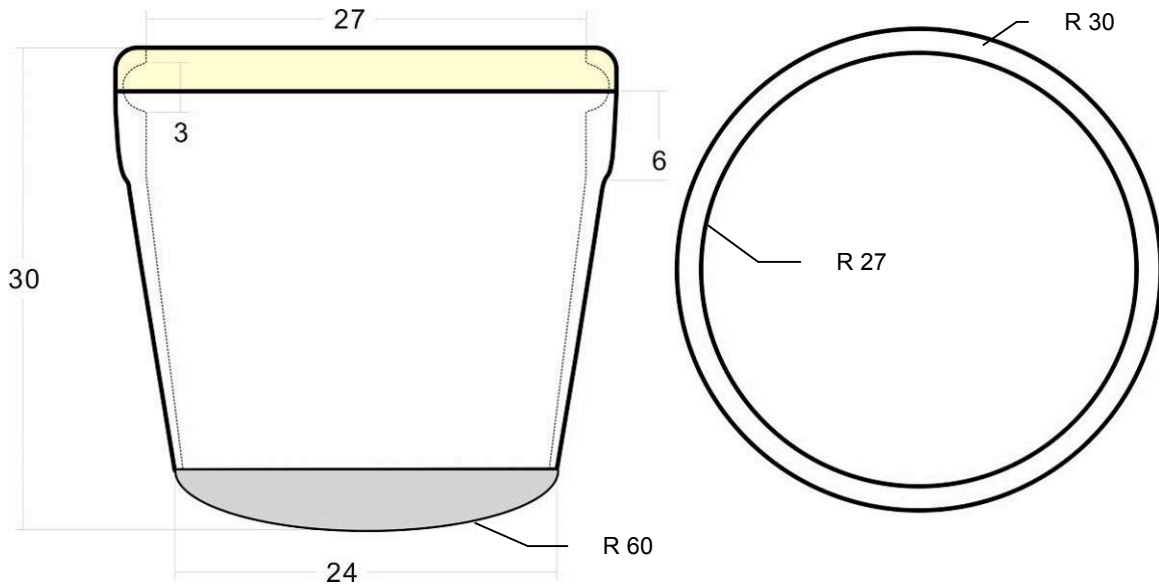


Figure 77. Trash can measurement



Figure 78. When people throw trash, how the trash can reacts

- The trash can tumbles and the light will flash a soft yellow color when trash is thrown into it.
- Parents can leave a message on the trash can to remind children to keep the room clean.
- There is a loop inside the trash can to keep the trash bag in the right position and to make the can look clean from the outside.
- The holes on the loop shown in Fig. 76 are for grabbing the trash bag.

## How to use



Figure 76. Explode view and detail of the trash can

- 1) Place the trash bag in the loop.
  - 2) Fold the edges around the loop to cover it.
  - 3) Press the bag into the holes on the loop so the bag will be steady and tight.
  - 4) Put the loop back into the trash can in the correct position.
  - 5) The trash can is ready for use.
  - 6) A parent teaches her child to use the trash can.
  - 7) A parent shows her child how to throw trash into the trash can.
  - 8) The trash can tumbles and lights up after the trash is thrown in.
- If the child has not thrown any trash away after 24 hours, the trash can will tumble to remind the child to clean up the room.



*Figure 77. Child throws trash and the reaction*

After the final system was developed, I presented it to interviewees who had previously tested it. They interacted with the system, and most people showed a high level of satisfaction with the products. They commented that the system has focused on the safety issue for children, and they liked the idea that children could add a personal touch to the product to make it unique and special. Based on these comments, I conclude that my designs deliver the following benefits:

- They are simple, easy to use, and are light and strong enough for children to use.
- Parents are able to communicate with their children.
- The designs are playful and creative.
- The products are suitable for most houses in Taiwan.
- The products are safe for children to use.

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As stated in the introduction of this paper, this project began with a question: Why do most young adults today lack basic life skills? The question has troubled me for a while, and, after researching and analyzing the problem, I have come to the conclusion that this is an issue that should be raised during childhood. Parents who do housework for their children are not helping their children's future development, and because housework is rarely attractive, children keep leaving the task to others. We need to turn housework into a fun, playful, and interesting activity to motivate children so they will be willing to start doing housework. With my research, I propose a new system to address this issue. I have designed a set of products for children that will turn daily housework into a game. Known as "fun-cleaning" devices, they will prompt children to start learning about housework—or at least to start cleaning up their own messes. Along the way, parents and children gain rewards and interesting experiences as they use the "fun-cleaning" system. Maintaining a positive attitude when doing housework encourages children to try to learn new skills. With the aid of this system, each family can develop their own methods of educating their kids about responsibility and independence by encouraging children to do housework. From these analyses, I extracted design principles to extend the housework area to the entire house, including the living room and kitchen. Through the production, distribution, and use of these products, I hope to establish good work habits during childhood so that children will grow up to be independent enough to handle their own lives in the future, which means less worries for parents, and a happier family.



*Figure 78. Children in the room with the system.*



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<http://www.commonhealth.com.tw/article/article.action?id=5029267>

*National digital library of theses and dissertations in Taiwan*

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<http://www.ikea.com/us/en/catalog/products/10053291>

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1. How old are you? \_\_\_\_\_ ☐ Male ☐ Female
  2. Do you have brothers and sisters? ☐ Yes, how many? \_\_\_\_\_ ☐ No
  3. Do you need to share room with you brother and sister?  
☐ Yes, do you like to share why? \_\_\_\_\_ ☐ No
  4. Who clean up your room? (Multiple options)  
☐ By myself ☐ Parents ☐ Sister (Brother) ☐ Housekeeper Other: \_\_\_\_\_
  5. How often do you clean up your room?  
☐ everyday ☐ 2~3days ☐ once in a week ☐ once in a month ☐ Never
  6. When you clean up your room what do like to clean up first? ☐ bed ☐ closet  
☐ trash can ☐ desk ☐ dirty close ☐ clean up toys others \_\_\_\_\_
  7. When you clean up your room what do dislike cleaning up first? ☐ bed ☐ closet  
☐ trash can ☐ desk ☐ dirty close ☐ clean up toys others \_\_\_\_\_
  8. Do you need to wear uniform to school? ☐ Yes ☐ No
  9. How often does your family do the laundry?  
☐ everyday ☐ 2~3days ☐ once in a week ☐ once in 2 weeks
  10. Do you need to go to cram school after school?  
☐ Yes, how many days? \_\_\_\_\_ ☐ No
  11. Do you like to play toys? ☐ Yes ☐ No
  12. How many toys do you have?  
☐ none ☐ few ☐ a box of toys ☐ many ☐ a room of toys

13. When could you play with your toys?

\_\_after dinner \_\_after school \_\_after writing homework \_\_anytime Others\_\_\_\_\_

14. Usually how long are you able to play?

\_\_\_15 min \_\_30min \_\_45 min \_\_1 hr \_\_1hr 30min \_\_2 hr Others\_\_\_\_\_

15. When you clean up your toys, how long it takes you to clean up?\_\_\_15 min

\_\_\_30min \_\_45 min \_\_1 hr others\_\_\_\_\_

16. Do you have a trash can in your room? \_\_Yes \_\_No

17. What is your favorite cartoon? \_\_\_\_\_

18. What is your favorite toy? \_\_\_\_\_

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